MEMOIR NUMBER—2 OF THE DEPARTMENT OF ARCHAEOLOGY IN PAKISTAN

SOAN



THE PALAEOLITHIC OF PAKISTAN

DEPARTMENT OF ARCHAEOLOGY
MINISTRY OF EDUCATION & INFORMATION
GOVERNMENT OF PAKISTAN

Memoir of the Department of Archaeology in Pakistan

Number 2

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FOREWORD

In West Pakistan, particularly in the Soan Valley, we have some of the earliest evidences of stone age man, claiming an antiquity of about half a million years. No human skeleton of that distant antiquity has yet been discovered, but the deposits of crude stone implements which fall within the geological sequence of the Pleistocene period, have yielded valuable specimens. The joint Yale-Cambridge Expedition of 1935 under Drs. H. de-Terra, T. de-Chardin and T.T. Paterson carried out in the Soan Valley a pioneering work of extraordinary importance for the study of the 'Late Cainozoic' period with the help of geology, palaeontology and prehistoric archaeology. They established for the first time a workable sequence for these early industries which is important not only for its own sake, but also for its possibilities to serve as a basis, if extended with caution, to other regions of Pakistan, for typological studies.

'Soan' is no longer a new name to the prehistorians. But unfortunately after the de-Terra Expedition, the work was not followed up. As a result Stone Age at present represents the least explored period of Pakistan Archaeology. It has left a vast gap in our knowledge, and whatever meagre information we have is based on typology, and not stratigraphic sequence. This is due mainly to our meagre progress made in the studies of Pleistocene geology and palaeontology. The need for a more systematic investigation based on a thorough survey and exploration of the various palaeolithic industries of Pakistan cannot be over-emphasised. A conscious effort is being made now to start this over-due work, and—as an essential preliminary to it—to publish the results of work done so far in this field to serve as a convenient spring-board for further research and investigations. It is in this context that the present work is of great importance.

Though a preliminary report of the joint Yale-Cambridge Expedition was published in 1939, this is the first publication of its complete work in the Soan Valley. The present effort also represents an excellent example of fruitful collaboration between the foreign scholars and the Department of Archaeology, Government of Pakistan. I hope the work will serve its purpose of stimulating further research in this field and receive a favourable reception in the scholarly world.

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Director of Archaeology,
Pakistan.

INTRODUCTION

Attention was drawn to the presence of palaeolithic artifacts in the Punjab first by Wadia(1) and then by K.R.U. Todd, who discovered a site at Pindigheb near Rawalpindi in 1930(2). In 1932 Dr. de Terra of the Yale North India Expedition, reported a find(3) and proposed a joint Yale-Cambridge Expedition for which Paterson was selected as Cambridge representative, geologist and prehistorian. He commenced work in the field in May 1935 and was joined by Drummond in October of that year. Mr. D. Sen of Calcutta University and Mr. V. D. Krishnaswami of Madras University were also attached to the expedition.

The collections were brought back to Cambridge for study and a preliminary finding was issued by Paterson in 1939(4). But the full description and analysis, completed mainly before the war, has had to wait this opportunity for refurbishing and emendation. All these artifacts described are now housed in the Cambridge University Museum, though half the total collection was sent to the Indian Archaeological Survey at Delhi, and a quarter to the Peabody Museum at Yale.

It appears advisable to expand upon the justification for foisting another name, Soan, upon the already over-burdened mind of the student of palaeolithic prehistory. A distinct series of industries carrying common elements developing through time has been found. These common elements include such well-known forms as the so-called "Lower Clacton core", the plain flake, varieties of core occurring in the "Brecklandian"(5), Levalloisian and Moustierian of Europe and East Africa, and faceted flakes. But, continuous through the series and forming in most industries the prominent feature, are pebble tools made either on unbroken or on fractured pebbles, the latter including peculiar forms

(1) Wadia, D.N., the Geology of Poonch State, 'Ind. Geol, Sur. Mem., Vol. 51, 1928.

(2) Commander Todd later presented this industry to the University Museum of Archaeology and Ethnology at Cambridge, and kindly gave the authors permission to study it and report on it in this volume.

(3) Hawkes, C.H., and H. de Terra, Palaeolithic Industries in the northwest Punjab, Conn. Acad. Arts, Sci. Mem., Vol. 8, 1934.

(4) de Terra, H. and Paterson, T.T., 'Studies on the Ice Age'.

(5) Nature, Vol. 143, 1939. p. 822.

of "flat-based" artifacts well known to us in the Cambridge collections of Wayland's Sangoan of Uganda, presented by Mr. Wayland himself. Also familiar to us in the same collections are the pebble tools presented by Mr. T. P. O'Brien as a type series of his Kafuan from Uganda. Yet, when the term 'Soan' was first used no series had been described in which these elements, pebble—core—flake, in conjunction, form sequent industries.

Thus the Soan series appears to merit a distinct cultural name. It may be argued that the name Kafuan has priority and, being a type example of an almost pure pebble-industry series, is more characteristic of those elements which are distinctive of what we are here grouping together under the name Soan. The counter argument is that firstly the Kafuan had not been established properly as a cultural entity when the Soan was first analysed, and secondly the Kafuan does not exhibit those characteristics of flake-*cum*-pebble associations which appear to be the logical antithesis to the Acheulian traditions. Moreover, the Kafuan is a culture specific to an area where small pebbles constitute the sole raw material, just as the Anyathian of Burma is specifically different from the Soan, also on account of the raw material, being silicified wood and tuff. Moreover, the Soan reveals most fully the fundamental characteristics of what we hope later to demonstrate as a widespread family of cultures.

It may further be argued that pebble-tool characteristics develop where the sole source of raw material consists of rounded water-worn pebbles, and that the flake-core element, which may be basic, is there submerged since there must be a natural tendency to make pebble forms in such circumstances to the exclusion of others. But in the Panjab, though the raw material includes large boulders, the flake-cores are made from precisely those pebbles which are also used for pebble-tools. It may also be said that the flake-core element is only submerged or reduced when small pebbles are the sole source, as in the Kafuan; but the Final Soan is made of small pebbles and the flake-core element is dominant. We feel completely justified in introducing "the Soan" as a culture into the terminology of prehistory.

We give, as an appendix, a description of a neolithic industry because of the apparent survival of palaeolithic, Soan, forms into that late period. But we have made no attempt to describe microlithic finds. These have been known for a long time, but no site has been found as yet. Scattered pieces are useless for our purposes.

Acknowledgements

Paterson was first encouraged to go to India by Mr. M. C. Burkitt and Dr. L.S. B. Leakey, whose enthusiasm for the project was equalled by that of the late Professor Hutchinson, Master of Pembroke College, Cambridge and Professor O. T. Jones. Financial assistance for Paterson to go to the Punjab was generously given by Cambridge University, the University Museum, his own College of Trinity, the Percy Sladen Fund Trustees, the Royal Society and the Royal Geographical Society to which bodies he is deeply grateful.

At various times we have had the advantage of discussion with M. l'Abbe Breuil, Mr. Burkitt, Miss D. A. E. Garrod, Mr. Kelley, Dr. Leakey, Professor Menghin, Mr. T. P. O'Brien, Professor Vaufrey and the late Dr. Van Stein Callenfels. In the field we had, of course, the constant friendship and encouragement of Dr. de Terra and the late Dr. Teilhard de Chardin; and from Dr. E. B. Pinfold we gained much information on the quaternary geology of the Soan basin as well as the magnificent collection he made at Morgah, and which he has kindly allowed us to publish.

The drawings of artifacts are the work of Mrs. E. J. Paterson. The text and drawings were prepared in the years 1946 and 1947. Other work, and circumstances beyond our control, prevented publication, but, the Director of Archaeology in Pakistan, learning of the existence of the book, pressed the matter. It is to his interest and enthusiasm that the publication of this book is owed; to him and his Department we wish to express our gratitude.

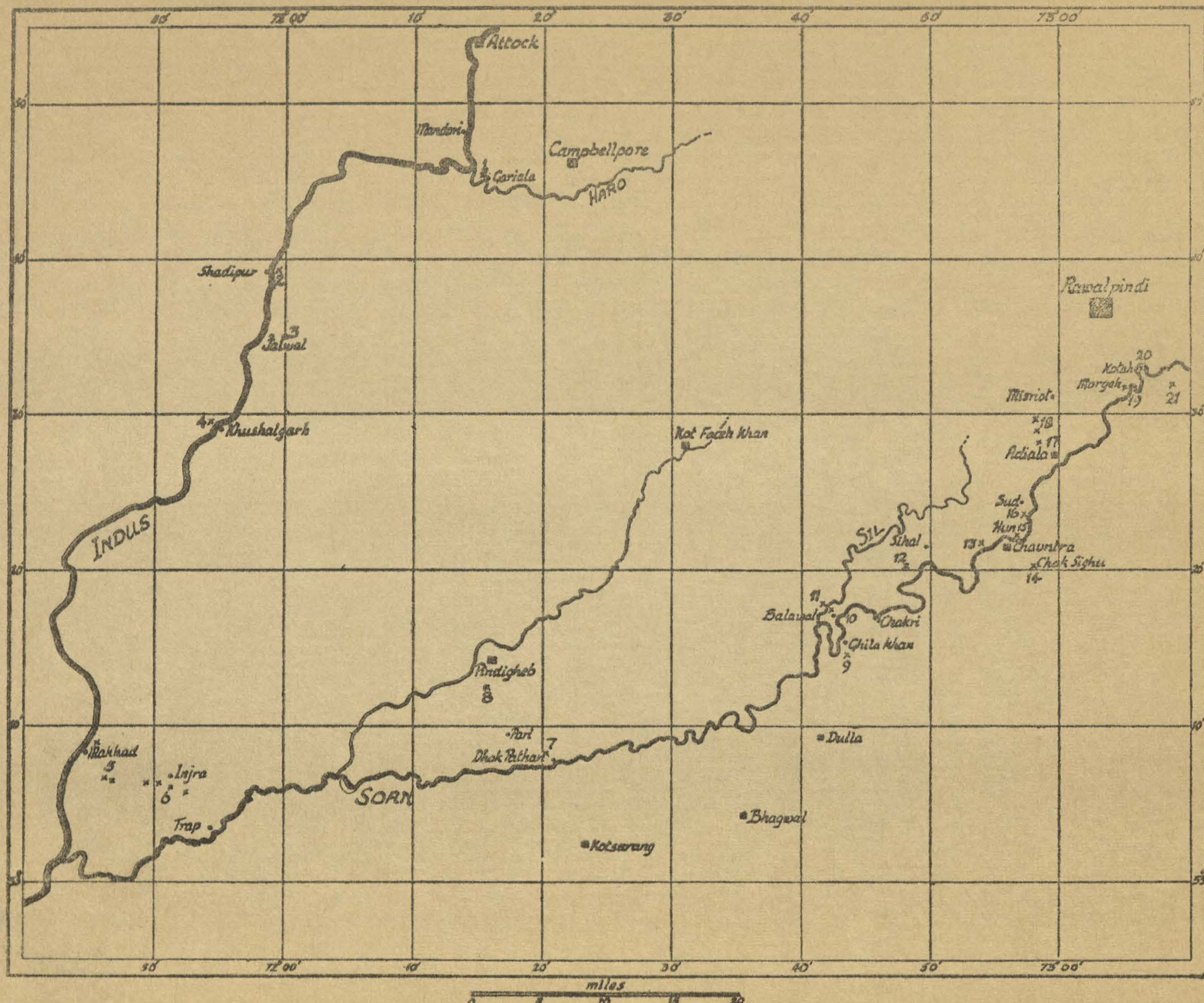


Fig. 1 Map to Show Area of Search and Sites.

CHAPTER I

THE GEOLOGICAL SEQUENCE—THE TIME SCALE

The geological sequence provides the chronological background against which the development of traditions and cultures is measured. For this purpose it is necessary to have a sequence terminology applicable in several areas. Accordingly we use a subdivision of the Pleistocene period which appears to hold in most parts of the world, and which has already been proposed by one of us elsewhere.* The Pleistocene, commencing with the first appearance of species of *Equus*, *Elephas* and *Bos*, is divisible into three *cycles of sedimentation*, (named Lower, Middle and Upper Pleistocene), the result of orogenic and precipitational changes contemporaneous over many regions of the Old World, (*see* Fig. 2, p. 13). These Lower, Middle and Upper cycles are each divisible into two *phases* named l_1, l_2, m_1, m_2, u_1, and u_2 respectively. The Pleistocene ends with a final phase u_3. Phases in different regions are capable of subdivision into stages but correlation of stages over wide areas is as yet most uncertain and, as far as prehistory in its broad aspect is concerned, is not necessary, certainly not for our purposes here.

There are five glacial stages recognizable in glaciated regions according to James Geikie's "The Great Ice Age", and, numerically named one to five, they occur at the beginning of phases l_1, m_1, u_1 and u_3, the fifth glaciation marking the close of the Pleistocene. Erosional stages in the Middle and Upper Pleistocene led to the cutting of terrace escarpments which are numbered consecutively according to the terminology proposed in the paper cited above.

The expedition first established the glacial chronology of the North West Himalaya in the Kashmir basin, and that part of the Outer Himalaya known as the Pir Panjal. Traverses of the Pir Panjal were continued into the foothills and thence into the plains so tracing the glacial deposits in their metamorphosis into alluvial sediments. Thus a chronology of the plains sequence in terms of mountain glaciation and orogenic disturbance was established. The plains area chosen was that known as the *Potwar*, whch is roughly bounded by the Indus in the

*Paterson, T.T., On a World Correlation of the Pleistocene. Trans. Roy. Soc. Edin., Vol. LX, 1941, pt. II.

west, the Jhelum and Poonch rivers to the east, the Pir Panjal foothills in the north, and the Salt Range in the South, the town of Rawalpindi constituting a focal point. (*See* Fig. 1).

In these plains occur the well-known fossiliferous Siwalik formations, the Lower and Middle Siwaliks including three zones, Chinji, Nagri and Dhok Pathan in that sequence upwards. The Upper Siwaliks are composed of three zones, Tatrot, Pinjor and Boulder Conglomerate. A direct connection was established between the Boulder Conglomerate and the outwash of the second glaciation of the mountains. The basal conglomerate of the Tatrot was found to correspond with the first glaciation and, by continuous tracing mountainward, a series of terraces was correlated with the later interglacial and glacial phases. The finer details of these discoveries can be found in the first volume of the expedition reports.*

1. The Opening of the Pleistocene

The Potwar forms a small part of the Himalayan foreland, a downwarped trough fronting the rising mountain chain, and receiving the products of its denudation. This process of infilling has been fairly uniformly continuous from Miocene times when the Himalayan orogeny commenced. The fine, brightly coloured and monotonously regular Lower and Middle Siwalik beds are typical of sediments of this nature. The Dhok Pathan beds are made up of grey and whitish sandstone, and red and orange clays indicative of semi-arid conditions. These beds carry a Middle Pliocene fauna whereas the succeeding Tatrot beds, carrying *Equus* and *Elephas*, are Lower Pleistocene. The intervening hiatus of Upper Pliocene age is represented by a well-marked unconformity, the basal Tatrot beds lying upon a widespread peneplain. It appears that, during the late Pliocene, uplift of the Himalaya occurred and also warping of the Middle Siwalik beds into shallow synclines or basins. Because of the uplift of the adjacent mountains the erosive power of the rivers flowing therefrom was increased; and by constant shifting of their beds over the wide, undulating Dhok Pathan plain they cut away the ridges intervening between the small, newly-formed synclines, in some places removing as much as about 1,000 feet of sediments. Upon this peneplain, the Tatrot beds were deposited, an unconformable relationship easily recognised where these beds overlap the tilted Dhok Pathan on the side of the basins, but less easily seen in the basin centres where there is an apparently conformable junction marked only by the sudden

*de Terra H., and Paterson T.T., Studies on the Ice Age in India, Carnegie Inst. Pub., No. 493, 1939.

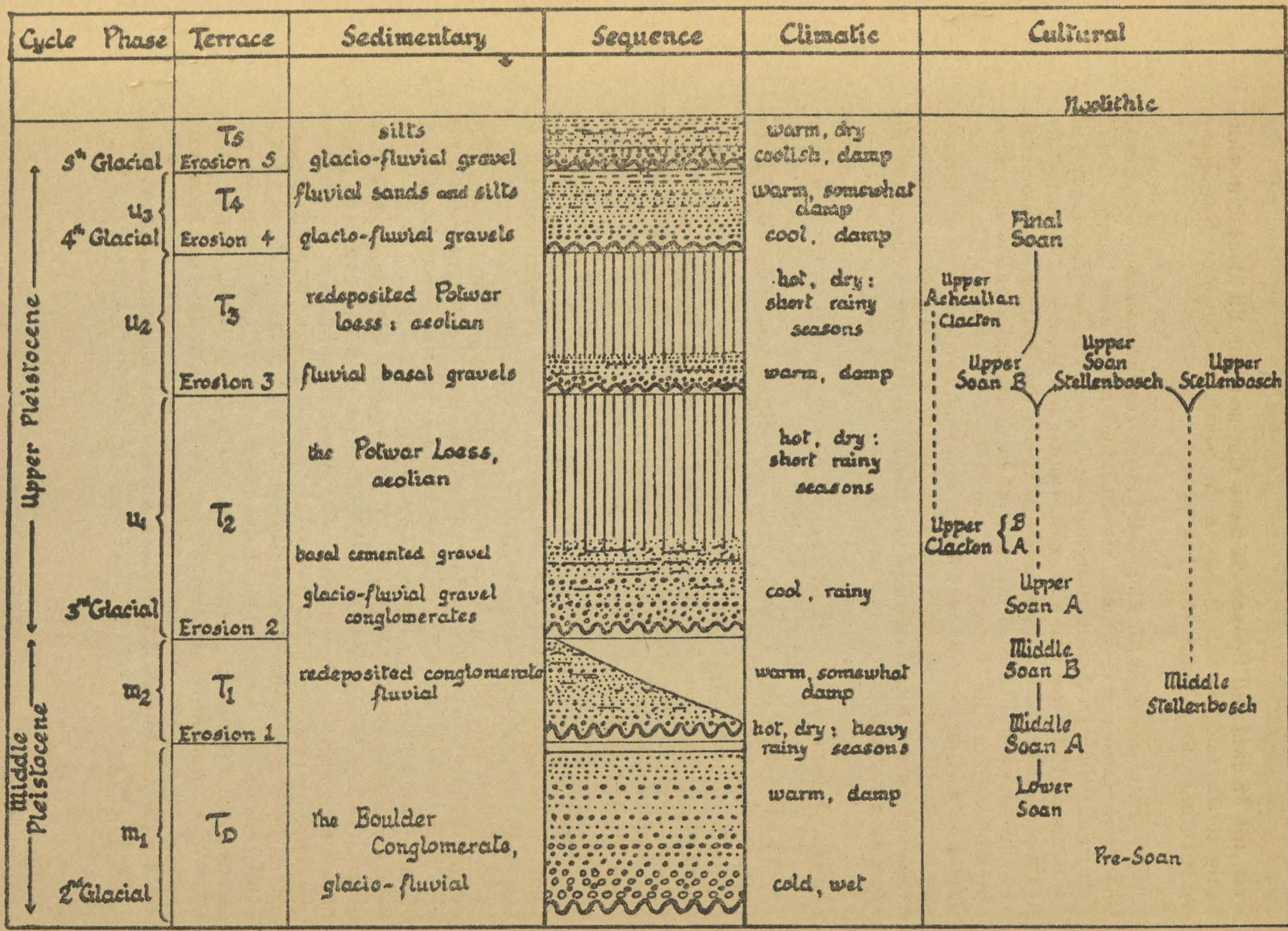


Fig. 2—The Pleistocene Sequence of the Potwar.

change of sedimentary facies, from fine sandstones to coarse conglomerates.

In the foothills of the Pir Panjal, where the warping was more intensive, the erosion of the Dhok Pathan series was not so pronounced, and there appears to be a conformable passage upwards into the Pleistocene. However, there the warping and infilling were simultaneous, with the result that the basal conglomerate of the Tatrot unconformably overlaps early Dhok Pathan beds laterally, yet overlies conformably an intervening series of beds which must be presumed late Pliocene in age.

2. The Lower Pleistocene Cycle

Thus the peneplanation of the Dhok Pathan terminated the alluvial sedimentation of the Lower and Middle Siwaliks and marked the commencement of the Pleistocene. The *TATROT* beds, (phase 1_1) are generally conglomerates and coarse sandstones, with occasional brown, clayey layers. The colour of the basal conglomerate, which carries many rocks of distant provenance, is grey or greyish brown contrasting, as do most of the Pleistocene beds, with the brilliant colouring of earlier deposits. These sandstones and conglomerates were not laid down over an extensive alluvial front, but were confined to the newly-formed synclines, in which the Jhelum and sister rivers were made captive. Owing to contemporaneous warping the Tatrot reaches in places a total of almost 1,000 feet in thickness. The conglomerates and sands lens out rapidly, varying laterally in facies; foreset bedding and delta forms are common, all signs of increase in power-volume the result of precipitational increase and orogenic movement in the mountain tracts. The climate was probably cool-temperate.

The sandstones become more common upwards and pass into evenly-bedded silts, sands and clays of the *PINJOR*, (phase 1_2), coloured pink, brown and grey. In the Soan region they amount to little more than 400 feet in thickness, but in the foothills they may be three to four times as much, due to their deposition in synclines still in process of downwarping. In the plains rhythmic banding and the loess-like character of the sediments suggest alternating rainer and drier periods, with wind-blown, fluvial silt and dust distributed during the dry periods and re-distributed by rivers in the rainy seasons. The rivers appear to have been much more sluggish and meandering, having worn down to a more even gradient the disturbed and uplifted drainage of the Tatrot. Fossils are more common, and the faunal and floral evidence suggests a warm-temperate climate, perhaps a little less sub-tropical than at the present day, with forest growths in the highlands and abundant vegeta-

tion in the low country, more arid in the later periods as the colouring of the finer beds would indicate.

The fauna of the Pinjor is the equivalent of that found in the Karewa Lake beds of Kashmir. There, it was discovered, the Karewa deposits are of first interglacial age and conformably succeed fluvial fans and conglomerates of first glacial origin. The Pinjor therefore seems to be of first interglacial age and the basal Tatrot stratigraphically would be the plains representative of the first glaciation. This is further strengthened by evidence of diastrophism. The greatest Pleistocene diastrophism of the Himalaya occurred during phase m_1, commencing just prior to the second glaciation which had its equivalent in the Boulder Conglomerate, the deposition and relations of which also show orogenic disturbances. A previous stage of diastrophism in the mountain tract immediately precedes the first glaciation, and thus would be correlated with the Upper Pliocene—Tatrot stage of uplift and peneplanation, which was succeeded by deposition of conglomerate with erratics. According to Krynine, (de Terra and Paterson, op. cit., p. 239), the Tatrot sediments of the higher parts of the Salt Range show, under petrological analysis, signs of frost action. Moreover the fauna of the Tatrot is not nearly so rich as that of the earlier Siwaliks and is made up of types more adaptable to climatic change, indicating a less favourable habitat for mammals. Thus it appears that the Tatrot conglomerate is the equivalent of the first glacial stage, and marks the beginning of sedimentation of Pleistocene age.

To recapitulate: the Lower Pleistocene began with diastrophic movements, uplift of the mountain tracts, downwarping of the plains sediments in minor synclines, increase of precipitation, erosion and peneplanation, glaciation of the highlands with a cool-temperate climate in the plains, deposition of conglomerate, and reduction of the fauna on the impact of glaciation. The cycle continued with diminished orogenic movements, final filling of the basins by more evenly graded rivers, warmer climate with richer fauna and development of forests, passing into more arid conditions with periodic dry times and formation of wind-blown silt and loess in laminated beds.

3. The Middle Pleistocene Cycle

The comparative quiet of Pinjor times was terminated by violent diastrophism during which the Pir Panjal was raised nearly 6,000 feet. These orogenic disturbances mark the beginning of the Middle Pleistocene cycle, their sedimentary equivalent being the *Boulder Conglomerate*, the latest of the Upper Siwalik series. Rapid uplift

led to greatly steepened river gradient and increased erosion of the rising mountain masses, the torrential rivers being capable of transporting great quantities of coarse grade rocks. In the foothills as much as 3,000 feet of boulder conglomerate and intercalated sandy beds filled the basins which were steadily deepening the while and, as a result, the later beds unconformably overlap earlier beds. Near the great boundary fault lines between the foothills and the plains, the continuing orogeny is marked by folding and thrusting of early layers of the Boulder Conglomerate.

In the plains the Conglomerate appears as large fans around the major fluvial outlets; and it also fills the downwarping synclines, in effect a rejuvenation of the Tatrot movements. In the region where the Jhelum debouches on to the plain, the Conglomerate is almost 4,000, and in the Soan basin nearly 1,000 feet thick. The conglomerates carry far-travelled erratics from the main Himalayan range, but locally derived conglomerates, usually with grit and even silt bands, are to be found surrounding the flanks of the minor hill ranges of the plains which were also suffering the effect of uplift. The upper half of the Boulder Conglomerate composing the fans of the main river outlets, and of the basin fillings in the foothills, carries glacially-faceted, erratic boulders, and can be traced upstream where it merges with debris of the second glaciation. Few fossils have been found, mostly *Equus*, *Bos* and *Elephas*, and there are no petrological signs of dry climate.

In various parts, where subsequent erosion has not removed them, well-bedded sands and gravels conformably overlie the Boulder Conglomerate from which they are derived, (cf. de Terra and Paterson, op. cit., Figs. 138 and 139). There are no signs of the torrential character of the Conglomerate, and both deposits have undergone a similar degree of warping. In the Soan basin the equivalent of these sands and gravels, is not easily distinguishable; here the Conglomerate has filled the basin, overflowing laterally, and later erosion has left little except the thin, higher, lateral stretches. This stage of sands and gravels completes phase m_1 of the Middle Pleistocene.

The beginning of the second phase, m_2, is marked by increase of erosion, with removal of much of the m_1 deposits and the cutting, over a long period, of a deep terrace escarpment, E_1. This erosional stage appears to be due to an increase in precipitation, not on the same scale of power as during glacial times but somewhat greater than that of the present day and continued through a long stretch of time. The widespread Boulder Conglomerate plain was dissected and the present drainage system begun. There is also evidence for continuation on a

minor scale of the major tectonic movements of phase m_1, emphasising the synclinal features of the plains, and warping the later sediments of phase m_1. These sediments do not seem to have been developed in the plains, (if they had they have been removed). Redistributed Boulder Conglomerate and a thin gravelly bed line the erosional surface, whereas in the foothills, and in the intermontane tracts such as Kashmir, fine conglomerates, gravels, sands and fine silts are banked against E_1. The lack of an aggradational series in the plains may be due to continuation of orogenic movements, with the result that the rivers were unable to attain even gradient suitable for fine deposition. The trench-like character of the tributary valleys is probably due to a similar cause.

During the long erosional stage the climate must have been quite congenial, and the abundance of human artifacts of this age is adequate testimony thereto. Unhappily there are no fossils to provide palaeontological verification but, in the Narbada Valley of Central India, deposits of the same age have yielded remains of horses, elephant, hippopotamus and buffalo. Later on in this phase the climate seems to have become drier, for there are traces of loess-like silt underlying third glacial gravels in the foothill basins.

4. The Upper Pleistocene Cycle

As in the previous two cycles the beginning of this is marked by uplift in the mountain tracts and warping along previously established lines in the foothills and plains. The heightened river gradient led to erosion, further augmented by precipitational increase associated with the onset of the *third glaciation.* This erosional stage of phase u_1 cut a new terrace escarpment E_2, and against it, in the foothills, are banked as much as 100 feet of conglomerates which can be traced into third glacial outwash. In the plains a conglomerate of finer grade, and often cemented, lies upon the eroded terrace surface and is succeeded by gravels and sands reaching a thickness of nearly 60 feet; on the Indus, near its confluence with the Soan River, it is about 30 feet thick. In the Poonch foothills the conglomerate and gravel appear to have been partially worn away prior to their covering by the succeeding deposit, but this minor erosional stage does not seem to be represented in the plains. The conglomerate and gravel, and the superincumbent Potwar loess of the plains can be brought together as the fluvial and loessic stages of phase u_1.

The *Potwar Loess* is the most striking sediment of this part of the north west. It mantles nearly the whole countryside from the plains

below 1,000 feet to about 2,000 feet altitude in the foothills. It fills the valleys and produces generally an evenly contoured surface on the plains, where subsequent dissection has produced canyon-like trenches reminiscent of a "bad-land" topography. It is yellowish to brownish yellow in colour, occasionally pinkish, fine and soft to the fingers and, unlike the Chinese loess, it shows fine stratification. The constituent grains under the microscope are angular and suggest aeolian origin, thus accounting for its distribution at such varying altitudes. The banding is interpreted by de Terra, as due to fluvial sedimentation of suspended dust by heavy seasonal rains just as today when the monsoons lay down fine films of silt clearing the air of its storm-roused dust.* The loessic material is charged with calcium carbonate which has destroyed almost all animal remains, hence bones are fragmentary and most infrequent, though land shells and a few fresh-water shells are to be found. This presence of solutions of calcium carbonate has brought about a cementation of the basal gravel of the Potwar loess, and also produced kankar and other concretionary matter. This cemented basal gravel is thus frequently distinguishable in the field from loose un-cemented gravel of third glacial age.

Erosion of the Potwar loess is the beginning of phase u_2. It seems to be of the same nature as erosion E_1, during a long interglacial stage with climate possibly a little more moist than the present day. It produces a well-marked terrace escarpment, E_3, cutting sharply through the Potwar loess, to be seen everywhere along the lines of the drainage established during the comparable second interglacial erosion. (*see* Fig. 7, p. 27). Although the erosional escarpment is so prevalent owing to its dissection of the ubiquitous loess, the succeeding aggradational series is not so common, probably due to later erosion within the confines of the third interglacial channel. A basal gravel, as much as five feet thick near the outlet of the Soan into the Indus, is overlain by a silt similar to the Potwar loess. This "redeposited Potwar" de Terra rightly terms a loessic loam since it shows not only the stratification of fluviatile aggradation of washed Potwar silt but also, in parts, the features of aeolian origin seen in the Potwar loess itself. Occasional bands of pebbles occur, and the whole may amount to 30 feet in thickness, sometimes banking up against the Potwar loess, when there is some difficulty in distinguishing them, unless the stratigraphical relations are apparent. Where the Jhelum emerges on to the plains this loessic loam is replaced by gravelly sands and silt.

The end of phase u_2 and the commencement of *phase* u_3 is indicated by recrudescence of uplift in the mountains and slight warping in the

* de Terra and Paterson, op. cit., pp. 247 and 275.

plains and foothills. In the Chaomukh syncline the Potwar loess surface is seen to tilt upwards towards the north, and five miles north of Rawalpindi it is warped and tilted. This uplift, and the *fourth glaciation* in the mountains, led to erosion of terrace escarpment E_4, against which are banked gravels continuous with fourth glacial outwash. Phase u_3 continues with aggradation of a gravel and sand capped by silt in the foothills and of a sandy loam in the plains, especially well marked along the Soan, where it forms a terrace flat about 20 feet above the river. Along the Indus this terrace flat is about 30 feet high. The fine silt is partly aeolian in origin. The top layers, which carry charcoal and pottery, are probably of post-Pleistocene age and not contemporary with the underlying silt, which is essentially a fluviatile aggradation. Phase u_3 and the Pleistocene end with a last erosional terrace escarpment, E_5, which is correlated with the fifth ice advance in the Pir Panjal. The lowest terrace sediments on the Indus and the Jhelum are fine, well-sorted gravels, sands, and silts, and it is with this last stage, and later, that the upper loessic layers of the terrace flat immediately above must be associated.

CHAPTER II

STRATIGRAPHY OF THE PALAEOLITHIC SITES

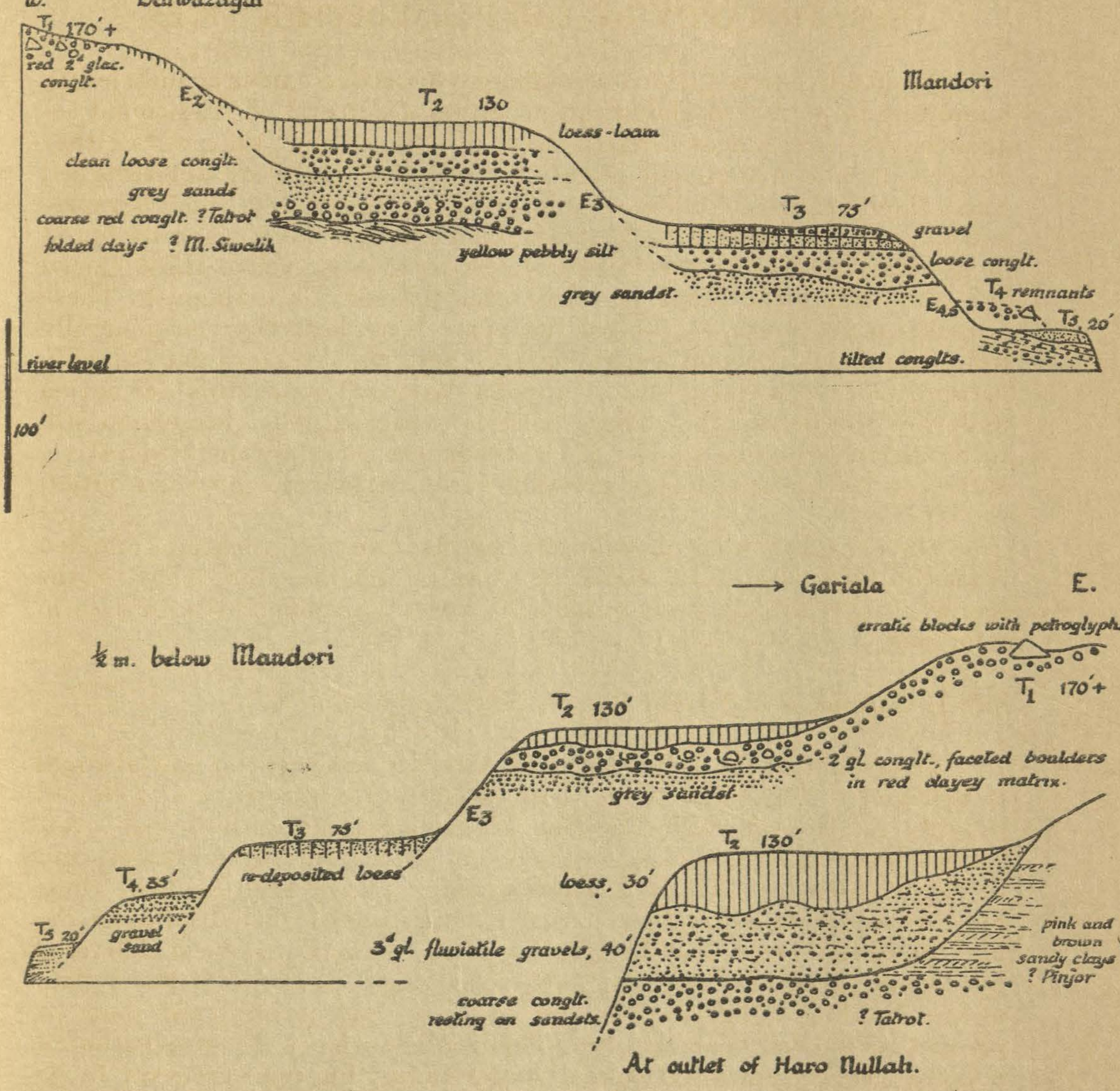
Twenty-five sites yielded assemblages of artifacts in situ, sufficiently numerous to permit of classification within a cultural or traditional sequence. At other places artifacts were discovered, but they were either derived, or not in sufficient quantity to classify; these are not recorded since they belong to horizons and cultural stages well enough represented in the list below. Such undescribed artifacts were generally found in the basal gravel of the Potwar Loess or in a gravel of third glacial age from which the basal gravel is often difficult to distinguish. These gravels, in the lower reaches of the Soan, have been derived generally from the Dhok Pathan conglomerates and, as de Terra has already pointed out, "one can almost predict sites wherever this formation underlies the peneplain". There must be many sites in this region still to be discovered. The survey of the Soan was certainly not exhaustive, and even less so was that of the Indus from Attock to the Soan outlet.

The stratigraphical descriptions of these sites have been compiled from the field notes of de Terra, de Chardin and Paterson; a few of the sections have already been published* but are included here for ease in reference.

Site 1, Gariala, near Campbellpore, 72°15′ E., 33°45′ N.

The course of the Indus south of Attock during second glacial times is believed to have lain to the east of the present river, and followed roughly the Haro Nullah. The Boulder Conglomerate in its upper levels carries large foreign boulders varying in girth from 15 to 50 feet, and in height from 6 to 12½ feet. They appear to have been brought there during catastrophic flooding caused by bursting of glacial lakes in the high mountain tract. The distribution of these blocks has been chartered by Theobald who believed them to be confined to the high flood plain of the Boulder Conglomerate, but Paterson has encountered them at present river level near Mandori. This would support the supposition of a more easterly ancestral course of the Indus, for the new river in its present course south from Attock, would cut through the old flood conglomerate and distribute these blocks at varying levels.

* de Terra and Paterson, op. cit.



Composite Section from Mandori to Gariala. Site 1.

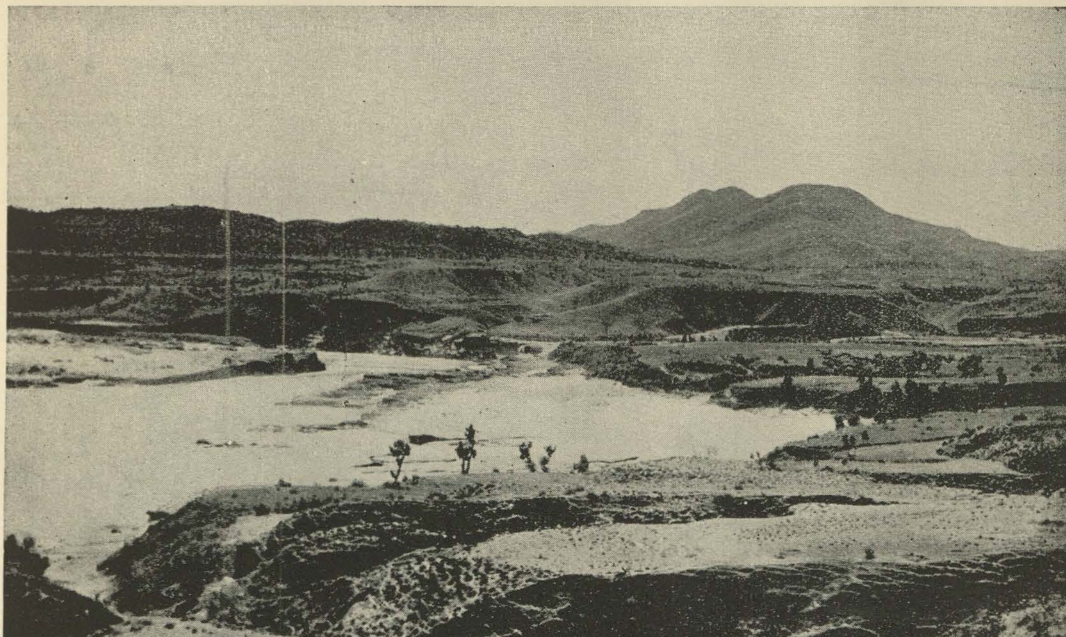
Fig. 3

At Gariala itself, near the outlet of the Haro, a good terrace section is not available. However, at Mandori more adequate exposures can be found, and the composite section, Fig. 3, from Mandori to Gariala, illustrates the sequence. The photograph, Pl. I, of the Indus terraces on the north side of the Kala Chitta Range, below Gariala and before the river cuts through the Range, provides a good impression of the terrace development, where successive erosion has not been too severely extensive. For more photographic illustrations the reader is referred to Plate XXVI, Nos. 2 and 3, in de Terra and Paterson, loc. cit.

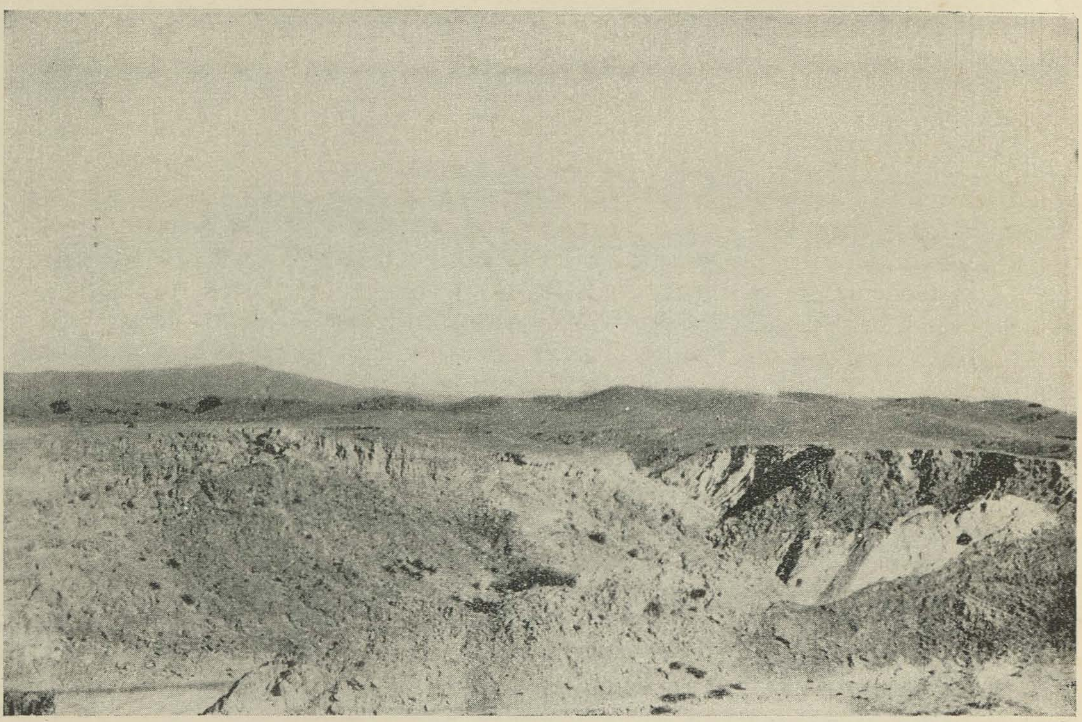
Around *Mandori* small nullahs have been cut into the terrace series and the exposures are fairly complete. The Boulder Conglomerate, with large erratics, lies at varying heights over 150 feet above river level, the escarpment E_1 being difficult and almost impossible to map because of the third glacial erosion of the present course. For this same reason terrace T_1, at about 130 feet, is fairly constant but dissected, and cut out of Boulder Conglomerate. On terrace T_2 a skin of gravel covers a few feet of pebbly loess-loam lying on a thin conglomerate, up to 2 feet of grey, clean, unstained pebbles, contrasting with the brown-stained Boulder Conglomerate. The grey conglomerate, presumed third glacial in origin, rests disconformably upon a grey sandstone carrying a thick, coarse, red-coloured conglomerate believed to be of Tatrot age, possibly representative of the first glaciation. It rests unconformably upon folded Middle Siwalik clays.

Terrace T_3, between 70 and 80 feet, is prominent. In it 9 feet of pebbly silt, covered by a thin gravel, lies on 20 feet of grey conglomerate which thickens towards the river and rests disconformably upon Upper Siwalik current-bedded sands. Terrace T_4 is not developed here, but half a mile lower down on the opposite bank it is well marked at about 35 feet, showing gravel and sand. Here too, the lowest terrace at 20 feet, the equivalent of the fifth glacial terrace of the mountains, can be made out. It is apparently subjected to flooding, and duck-haunted pools with mimosa scented scrub make it most attractive after the dusty dryness of the higher terraces. At Mandori itself, large boulders from the Boulder Conglomerate have come to rest near the water's edge and on them are to be found some petroglyphs described in Appendix B.

On the east bank half a mile below Mandori the Boulder Conglomerate is well exposed down to nearly 100 feet in terrace T_2. Faceted boulders are to be found occasionally embedded in a clayey matrix, the clay laminae curving parallel to the stone surface. The clay is presumably glacially derived and may be genetically connected with the mud-avalanche, glacial-dam, origin of the large foreign boulders. Nearer the



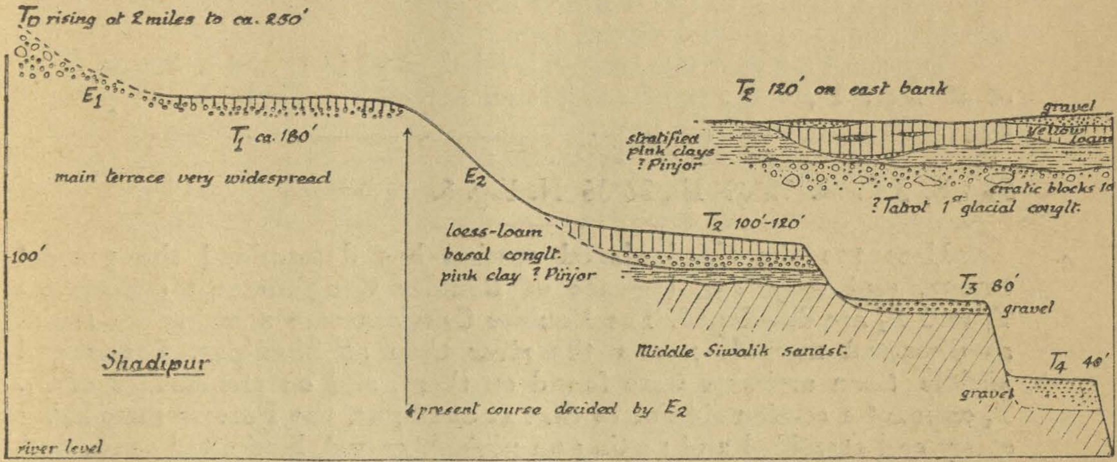
The Indus Terraces, North Side of the Kala Chitta Range below Gariala



The Indus Terraces at Shadipur, I and T

Haro outlet the third glacial deposit takes the form of a gravel contrasting with the conglomerate of the Indus at Mandori. This agrees with the assumption that the Indus had already established its present course in third glacial times, while the Haro Nullah came to be occupied by a minor stream of much smaller transporting power. On this gravel true Potwar loessic silt reaches a thickness of 30 feet and clearly lies upon an eroded surface of the third glacial gravel. The erosion may be due to diversion of the Indus as it swung in lateral erosion during phase u_1 on decrease of precipitation.

Site 2, Shadipur. Plate II, and Fig. 4.



Site 2. Shadipur.

Behind the village on the west bank, and similarly on the east bank, the ground slopes up to a wide terrace flat at nearly 200 feet, made up of second glacial conglomerate covered by a thin skin of wind-blown Potwar loess. Wide flat mounds of conglomerate reach heights of 250 feet and more. The 180-200 foot terrace, T_1, in its great extent indicates the long lapse of time occupied by the second inter-glacial phases. Here, as elsewhere lower down the river, it is the most prominent and the most useful topographic feature which can be used in determining terrace sequences.

The village of Shadipur stands on terrace T_2 at nearly 120 feet. The communal field system extends over the Potwar loess-loam which covers this terrace. In these parts of the Indus valley, and also in the Soan, the distribution of settlements is governed by the occurrence of Potwar loess and water supply, and in seeking exposures of loess on

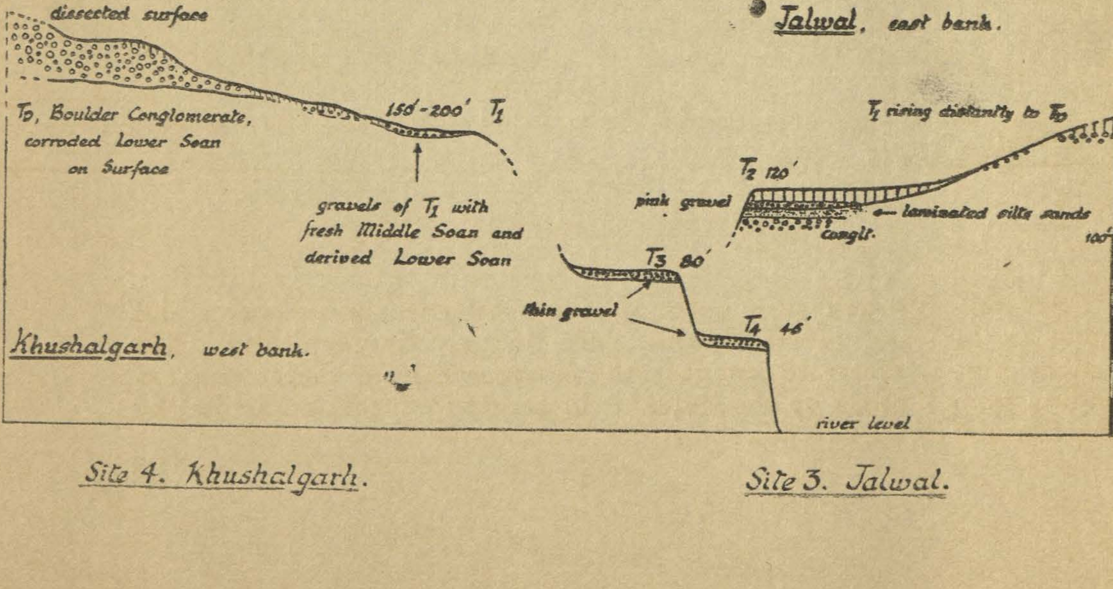
the higher terrace flats one is guided by this relationship. At Shadipur the loess overlies a thin, cemented gravel-conglomerate which rests on pink clays and sandstones. On the east bank a side nullah shows a section nearer the main course of the third glacial stream. The loess is there loamy and stratified, with pebbly layers and an inconstant basal pebble bed. It lies on the dissected surface of pink clays, which in turn cover a thick conglomeratic gravel through which are interspersed large blocks of limestone, (? Nummulitic), up to 10 feet in length. The clays are-similar to the Pinjor elsewhere wherefore it is believed that the erratic bearing conglomerate is likely to be Tatrot of first glacial age. The origin of the blocks in such a deposit can only be explained by postulating phenomena similar to those which transported the large erratics of the Gariala region of second glacial age.

Terrace T_2, a sporadic terrace level T_3 at 80 feet, and a lowest level of 40 feet, T_4, cut out of sandstone, are all confined to the present entrenched course of the river.

Site 3, Jalwal. 72°00′ E., 33°35′ N. Fig. 5.

Here too the third glacial erosion has determined the present course, and only T_D, (terrace of Boulder Conglomerate deposition) T_1 and T_2 are developed. The Boulder Conglomerate remains are found as dissected mounds nearer the river than at Shadipur. Lower and Middle Soan artifacts were found on them, and on the surface of T_1. T_2 exposed a section similar to that at Shadipur, the Potwar loess being stony and stratified and resting on pinkish gravel, laminated sands and silts, and a basal gravel conglomerate. The pink colour is believed to be derived from denudation of Siwalik formations.

Site 4, Khushalgarh. Fig. 5.

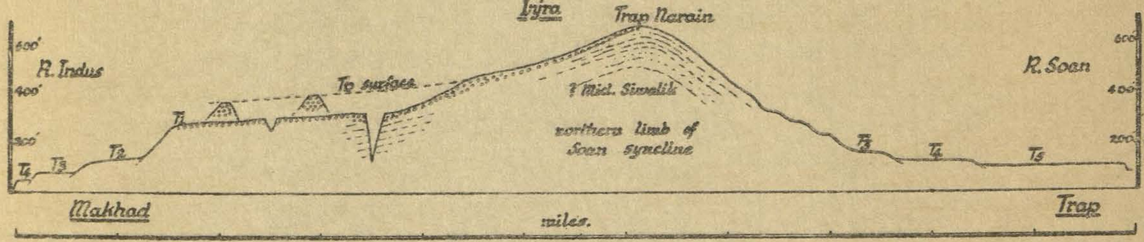


Site 4. Khushalgarh. Site 3. Jalwal.

The Kohat railway crosses the Indus at this point. Above the bridge, on the right bank, a small nullah cuts through a terrace of about 80 feet, against which are banked small remnants of a 50 foot gravel terrace, T_4. Both terraces are cut into rock and show only thin aggradational covering, perhaps due to confinement of the river within narrow limits. Above these terraces, at heights from 150 to 200 feet, is a widespread but dissected flat, which appears to be the equivalent of T_1 in the upper parts of the river. It extends laterally as broad, flattened ridges rising perceptibly to another, older level over 250 feet even more dissected and hollowed, T_D. Both these dissected early terrace remains are composed principally of Boulder Conglomerate, though sandstone crops out.

About 500 yards N.N.W. of the Rest House a section in T_1 set back from the nullah's edge shows a thin capping of wind-blown dust over a coarse gravel conglomerate, which occurs only infrequently on this terrace. Here were excavated a series of Middle Soan B artifacts and some derived Lower Soan. Artifacts were found south of the railway station and also north of the excavated site, but not in the gravels themselves. Some of these, of a particularly hard quartzite, were deeply corroded; the normal brownish patinated covering had broken up and disintegrated. Only very long exposure to variations in climtae could have produced such a phenomenon, which is frequently to be found among the conglomerates of the two uppermost levels, T_D and T_1, but is not seen at lower.

Sites 5 and 6. Makhad and Injra. Fig. 6.



Sites 5 and 6. Makhad to Trap.

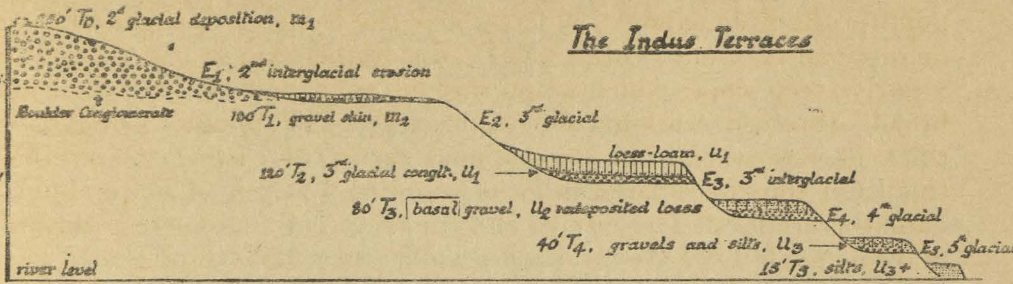
Several scattered sites north of the confluence of the Soan and Indus are best considered together since they are complementary. The section, Fig. 6, illustrates roughly the configuration of the terrain extending from Makhad on the Indus to Trap on the Soan, and across the Trap Narain Ridge two miles north of Trap.

The Ridge separates the Soan Basin from the Indus and was in part elevated in post-Boulder Conglomerate times for, on the highest point of the Ridge about 750 feet above the Indus, a thin skin of Conglomerate can be found. On the Makhad side this skin can be traced down a fairly steep slope, which is interpreted as erosion E_1, and thence to a broad, dissected erosional flat, terrace T_1. The Boulder Conglomerate thickens riverwards, the depositional surface T_D being discernible as small flat tops to isolated hillocks standing 100 feet or more above the main terrace level. These tops, and the surface T_1, are perceptibly tilted at a low angle towards the Ridge, which suggests a third glacial age for some of the uplift at least. Terrace T_2, as in other parts of the Indus valley, is confined to the immediate neighbourhood of the present course, and is thus not nearly so extensive as T_1. The greater part of the dissection of T_1 belongs to the third glacial erosional stage since the surface T_2 runs up between the isolated "outliers" of T_D forming a kind of "dry valley" topography. Later erosional features are developed in some of them as deep gullies and, along the river, as terrace T_3 and T_4.

The Trap Narain Ridge forms part of the northern limb of the Soan syncline, the present course of the Soan lying north of the main axis of the syncline. On the Trap side of the Ridge in the higher parts Boulder Conglomerate is absent, and a thick series of Tatrot and Pinjor sediments are exposed dipping south-eastwards. The contours follow a true dip slope, and when Boulder Conglomerate begins to overlap the sandstone unconformably about 4 miles N.W. of Trap, it is difficult to distinguish depositional surface from terrace surface. Erosion and tilting add to the confusion, but T_1 appears to conform roughly to the dip slope, in keeping with the suggested third glacial uplift and tilting on the Makhad side, and with the continued warping of the same age to be found elsewhere in the Soan Basin.

Terrace T_2 lies about 4 miles N.W. of Trap. It is not well marked and the impression is one of a series of meander terrace escarpments developed when the river swung laterally in third glacial times wearing down the gap in the rising barrier to gain the Indus in the west. A fairly distinct terrace, T_3, at 80 to 85 feet, and a wide one, T_4, at about 45 feet, can be traced. It is in this area that there occurs the greatest development of T_5, the lowest terrace, at about 15 feet, elsewhere traceable up into glacial debris of the fifth glaciation.

The Indus Terrace Sequence. Fig. 7.



The Indus Terrace Sequence.

The terrace sequence of the Indus can well be summarised at this point. In the sequence already published* the effect of uplift on terrace heights was not there explained, since that publication did not include the Pleistocene of the Indus given here. The heights for the Makhad region are abnormal, but in the wider depositional basins away from the effects of uplift of the Kala Chitta and similar ridges such as the Trap Narain, the terrace heights appear to be more constant, especially in the plains around Shadipur which may be taken as fairly typical. The sequence follows that already outlined in the first chapter, on the Pleistocene of North India.

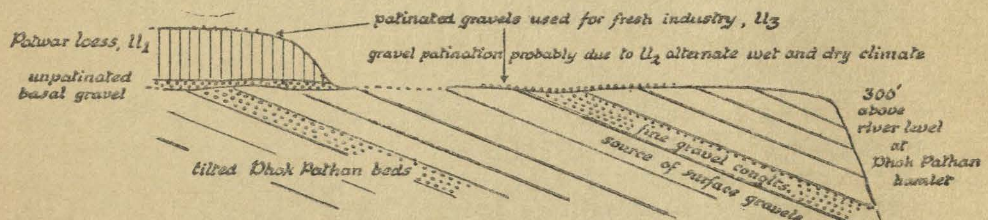
In the Tatrot a conglomerate carrying large erratic boulders probably represents the first glaciation; it is difficult to postulate any other origin for such a heterogeneous deposit. The succeeding fine-grained sands, silts and clays have yielded a type series of Upper Siwalik fossils. Boulder Conglomerate overlaps these beds unconformably against the borders of anticlinal uplift, but in the intermontane basins they are conformable. Uplift of these anticlines seems to have gone on throughout Boulder Conglomerate times, with corresponding depression of the basins into which the river poured its mass of far-travelled erratics. Rapid deposition and contemporaneous depression thus caused widespread scattering of the Conglomerate to a depth of at least 50 feet, and probably much more, for miles on either side of the present course. As the second glacial precipitational increase eased off the deposition of the Conglomerate came to an end, the river confined itself to a more limited course, and then throughout the long second interglacial period it eroded a wide terrace flat between 180 and 200 feet, T_1, now the

* de Terra and Paterson, op. cit., Fig. 181, p. 303.

most prominent feature of the intermontane basins. The Conglomerate depositional surface, T_D, about 250 feet, survives as isolated hillock tops well away from the river. It is on these terrace surfaces that the Lower and Middle Soan artifacts are found, some thoroughly corroded through long exposure to the varying climates of succeeding times.

The third glacial erosion stage determined the present course of the Indus, and all subsequent terraces are concentrated within a mile at the most from the river. Terrace T_2 was cut to a depth of about 100 feet above the present river, and on it were aggraded fine conglomerates, or gravels, as the third glacial stage passed away. During phase u_1 of the Upper Pleistocene loess-like silt accumulated, the "Potwar Loess", stony and stratified in places near the river where seasonal flooding had rewashed it. During phase u_2 the river cut through this loess and redeposited it as a silt over a thin basal gravel on a lower terrace, T_3, reaching a height of about 80 feet. Most of this terrace was removed by fourth glacial erosion, which was succeeded by aggradation to 40 feet of gravels and silts. The fifth glacial erosion cut through this, probably to below the present river bottom, and the latest aggradational stage built up the lowest terrace flat at 15 feet.

Site 7, Dhok Pathan. 72° 20′ E., 33° 08′ N. Fig. 8.



Site 7. Dhok Pathan.

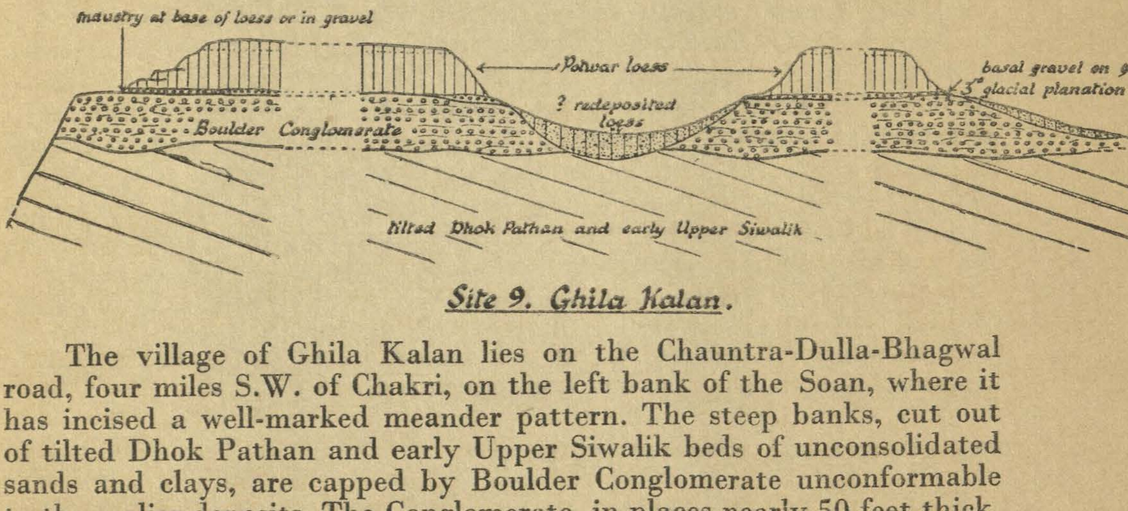
The small village of Dhok Pathan lies on the road from Pindigheb to Kotsarang where it crosses the Soan about 8 miles S.S.E. of the former town. Here the river runs between steep banks over 100 feet high, cut out of consolidated Middle Siwalik beds; this is the type station for the Dhok Pathan series of the Middle Siwalik. The exposures of these beds are mantled by a thin capping of pebbly gravel derived from the Middle Siwalik conglomerates, and a loessic residue. This is an ancient peneplain of early Lower Pleistocene age. The industry, found mainly in an area of about a quarter square mile on the west side of the Pindigheb road, one and a half miles from Dhok Pathan, cannot therefore be geologically dated with certainty.

But similar pieces, also with flake surfaces unpatinated, are found on the top of nearly 10 feet of loess which occurs about two and a half miles nearer Pindigheb. A gravel at the base of this loess is unpatinated, contrasting with the deeply patinated gravel exposed on the peneplain surface close by. Hence the patination of this gravel seems to be post-loessic in date, "and we may be sure that such patina could not have developed unless the climate since that time had been alternately wet and dry", (de Terra and Paterson, op. cit., p. 293). Since the industry is made partly from such patinated pebbles, and the flake surfaces are fresh, it can be assumed that the industry is no earlier than the latest Pleistocene to which it is thus assigned.

Site 8, Pindigheb. 72°17′E., 33°13′N.

This site was discovered by Lt. K. R. U. Todd, R.I.N., and was first reported by him in the Punjab Gazetteer of 1932. Mr. Todd very generously gave the industry to the Cambridge Museum of Archaeology and Ethnology. The industry was found beside a small tank nearly two miles due south of Pindigheb, on the west side of the track leading to the village of Pari, and not far from a small temple marked on the 1 in.=2 m. map. The site lies over 200 feet above the river at Pindigheb, and its geological relations are similar to those at Dhok Pathan, which industry is typologically the same.

Site 9, Ghila Kalan. 72°44′E., 33°15′N. Fig. 9.



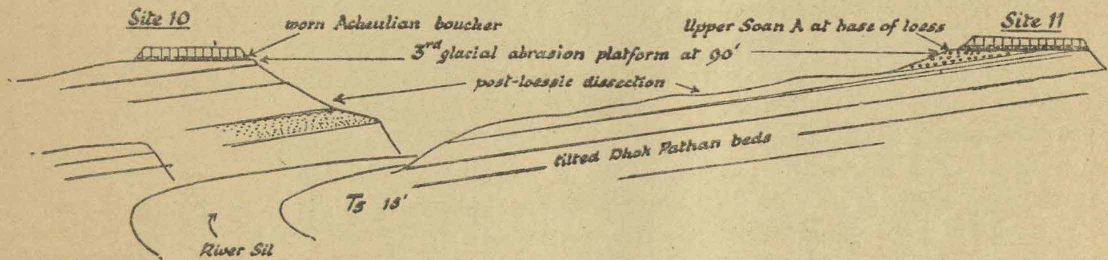
Site 9. Ghila Kalan.

The village of Ghila Kalan lies on the Chauntra-Dulla-Bhagwal road, four miles S.W. of Chakri, on the left bank of the Soan, where it has incised a well-marked meander pattern. The steep banks, cut out of tilted Dhok Pathan and early Upper Siwalik beds of unconsolidated sands and clays, are capped by Boulder Conglomerate unconformable to the earlier deposits. The Conglomerate, in places nearly 50 feet thick, has been planed off and forms a resistant ledge from 90 to 120 feet. De

Terra believes the planation of the surface to be third glacial in age, on analogy with other sites in the Soan Basin to be described. It is capped by 30 to 40 feet of Potwar Loess, with a fine gravel at its base, and a layer of iron pellets, a pan soil, towards the top.

The main industry, fresh and unworn, was found either in situ protruding from the very base of the loess, or in the exposed gravel with interstitial loess. Some flakes appeared to be grouped naturally around individual cores. Large, heavily worn flakes of pre-Soan type were also found on the slope below the loess, and a core with a few flakes, razor-sharp, came from the loess itself.

Site 10, Balawal. 72°43′E., 33°18′N. Fig. 10.



Sites 10, 11. Balawal.

This site lies on the right bank, half a mile north of the village of Balawal, and some 4 miles N.N.W. of Site 9, on a ridge between the Soan and a small affluent called the Sil. The Boulder Conglomerate is missing, but the third glacial abrasional surface is very well marked, corresponding in height with that at Site 9, at 90 feet. Here the basal gravel of the Potwar Loess forms a resistant ledge, owing to its conglomeratic and cemented character. This gravel is as much as 6 feet thick in places and rests directly on the tilted Dhok Pathan, principally a conglomeratic facies, from which were obtained Mastodon, Merycopotamus, and Hipparion. The Potwar Loess, nearly 30 feet thick, forms an isolated capping, demonstrating the extent of the post-loessic denudation.

A well-worn boucher was found in the cemented gravel-conglomerate. Typologically it is not earlier than Middle Acheulian though it may be later. It could be of third glacial or second interglacial age but it corresponds in position with the Chak Sighu find, Site 14 (q.v.).

Site 11, Balawal. 73°42′ E., 33°18′ N.

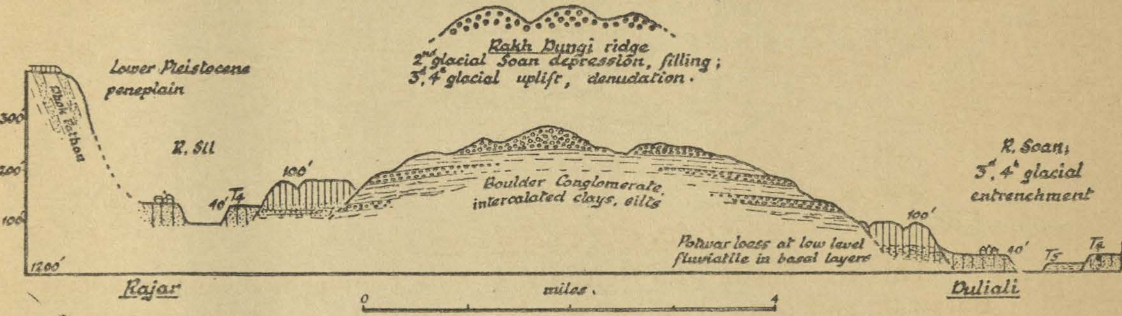
About one mile N.N.W. of Site 10, on the opposite bank of the Sil affluent, the Potwar Loess is seen to have the same relations as at that

site. Here a number of Upper Soan artifacts were extracted from the basal gravel of the Potwar, especially in an old gully now filled with 30 feet of loess, and on the edge of a steep, overhanging escarpment of Potwar overlooking a side valley. Some derived Middle Soan artifacts were also found.

Site 12, Sihal. 72°48′E., 33°20′N.

The Chakri-Sihal road keeps to the right bank of the Soan, and near milestone 23, just over 2 miles S.W. of Sihal, it traverses a ledge of Boulder Conglomerate, about 90 feet above the river, capped by loess. Pre-Soan flakes were found on the eroded surface of the Conglomerate, and Upper Soan on its upper surface where loess had been removed.

Site 13, Duliala. 72°58′E., 33°22′N. Fig. 11.



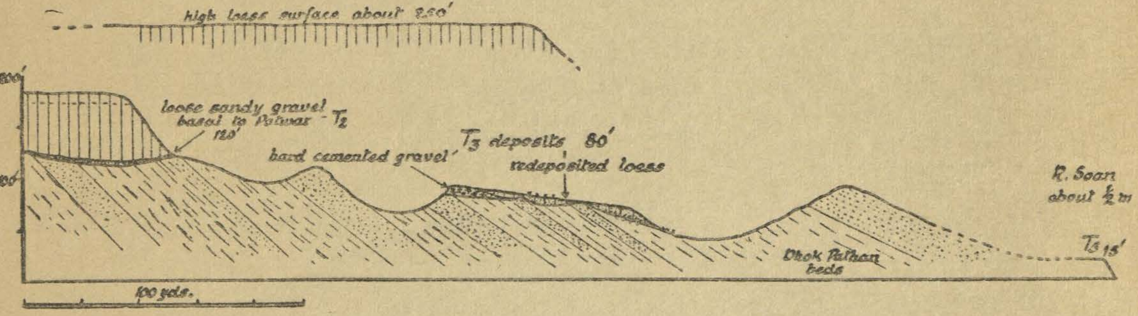
Site 13. Duliali.

Fig. 11 shows a cross section of Site 13 (which is two miles due west of Chauntra on the right bank of the River Soan), extending across the Boulder Conglomerate ridge separating the Soan from the Sil River. The Sil debouches lower down near Balawal. The Boulder Conglomerate ridge extends north-eastwards rising in height and forming the prominent Rakh Dungi south west of Adiala. Sections show that the Conglomerate, anticlinal in disposition, is nearly 400 feet thick and built up of three main bands separated by pink sands and silts. Pre-Soan flakes were found high up on the Conglomerate surface.

In both the Sil River and on the flanks of the Soan the Potwar loess is found to be nearly 90 feet thick with a fine sand at its base which is at a much lower level than elsewhere in the Soan Basin (almost that of the present river). These Pleistocene deposits have been accumulated in the centre of the syncline up till the end of Middle Pleistocene times. This accounts for the great thickness of the Boulder

Conglomerate. It appears that in third glacial times anticlinal uplift of these central portions and further sinking of the flanks led to the information of the main ridge and the entrenchment of the rivers in the lateral areas. This process was repeated in post-loessic times, bringing the loess to lower levels and the Conglomerate to higher. The sharpness of the ridge features may be in part due to this latest upward movement which must have taken place about fourth glacial times, for the last, or fifth, glacial terrace, T_5, is present in both river courses close by. Such movements thus seem to be synchronous with those of the Himalayan Pleistocene and of the foothills, as at Chaomukh (Site 25).

Site 14, Chak Sighu. 72°58′E., 33°20′N. Fig. 12.



Site 14. Chak Sighu.

This site is important since it is the key to the time relations of the Soan and an invading biface culture. The exact interpretation is not conclusive, but de Terra and de Chardin agree that fresh bifaces found here in situ are later than the Upper Soan A of the basal gravel of the Potwar Loess. Worn bifaces could have been derived from the basal gravel or from earlier, second intergalacial beds.

About two miles south east of Chauntra, near the track to Bandot, the soft Dhok Pathan rocks have been dissected into ridges which, on account of the direction of strike, here run in waves parallel to the river. The site lies on the crest of the second wave at a height of 80 feet above river level. This, in the undisturbed Soan terrace sequence, is about the normal height of Terrace T_3, that is, of third interglacial age, u_2, (though it should not be forgotton that quite extensive movements of fourth glacial age have occurred only a few miles away in the centre of the basin). Nevertheless, at about the 120 feet level farther away from the river, typical T_2 sediments are to be seen, the height being normal for that terrace. Thus it seems we can be assured that the terrace group has not been disturbed but only eroded, and that the site gravels

and silts at 80 feet represent the survival of terrace T_3, after late and post-Pleistocene denudation of the unprotected, friable, Dhok Pathan below.

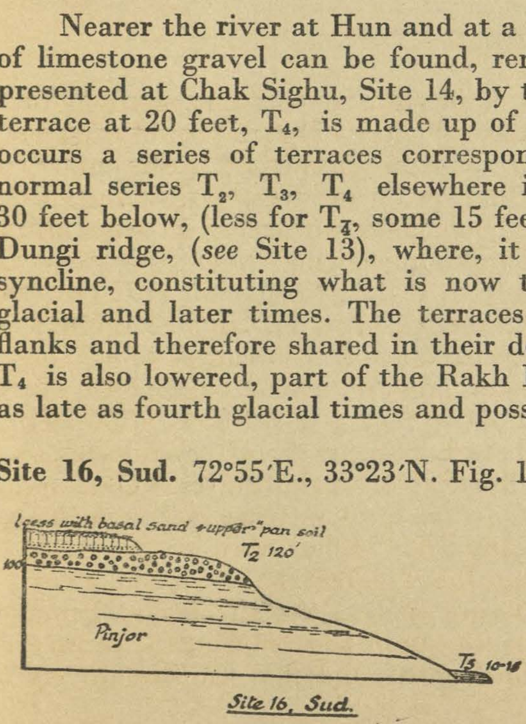
The deposits of T_2 are composed of a two foot basal gravel of rounded lime-stones more or less loose in a sandy matrix (cf. site 15). It is overlain by nearly 60 feet of typical Potwar Loess with an iron pellety layer towards the top. In places de Terra noted bluffs of loess showing a thickness of 150 feet and he estimates an original thickness of between 250 and 300 feet. From the base of the Loess sporadic Upper Soan A cores, flakes and pebble tools have been taken.

The gravels of Terrace T_3 are cemented hard and are composed mainly of quartzites, Siwalik sandstones and limestones. They occupy the crest of the ridge and thin out rapidly downhill. Close by, a thin skin of pinkish, sandy silt, redeposited Potwar, reaches the top of the ridge and thickens downhill riverwards to about 5 feet at the most, clothing the slope as shown in the figure. At its base a thin gravel rests directly on the Dhok Pathan. It is undoubted that the silt overlaps the gravel, is thus of T_3 age, and so should be interpreted as belonging to the interglacial phase u_2.

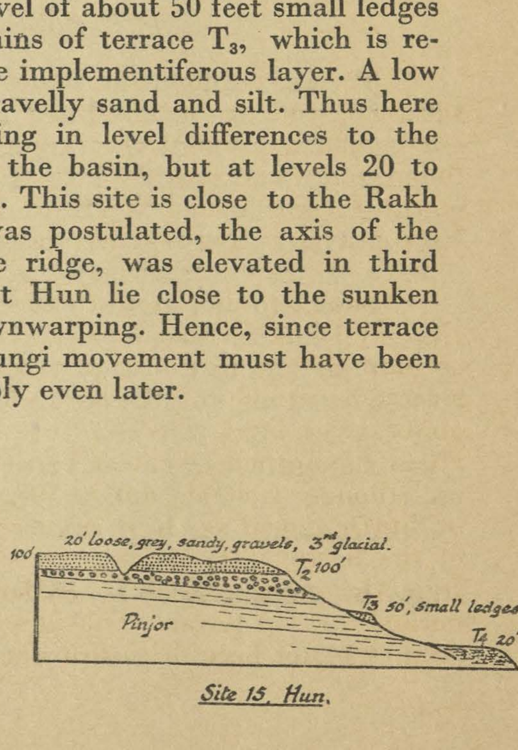
Site 15, Hun. Fig. 13.

Nearer the river at Hun and at a level of about 50 feet small ledges of limestone gravel can be found, remains of terrace T_3, which is represented at Chak Sighu, Site 14, by the implementiferous layer. A low terrace at 20 feet, T_4, is made up of gravelly sand and silt. Thus here occurs a series of terraces corresponding in level differences to the normal series T_2, T_3, T_4 elsewhere in the basin, but at levels 20 to 30 feet below, (less for T_4, some 15 feet). This site is close to the Rakh Dungi ridge, (*see* Site 13), where, it was postulated, the axis of the syncline, constituting what is now the ridge, was elevated in third glacial and later times. The terraces at Hun lie close to the sunken flanks and therefore shared in their downwarping. Hence, since terrace T_4 is also lowered, part of the Rakh Dungi movement must have been as late as fourth glacial times and possibly even later.

Site 16, Sud. 72°55′E., 33°23′N. Fig. 14.



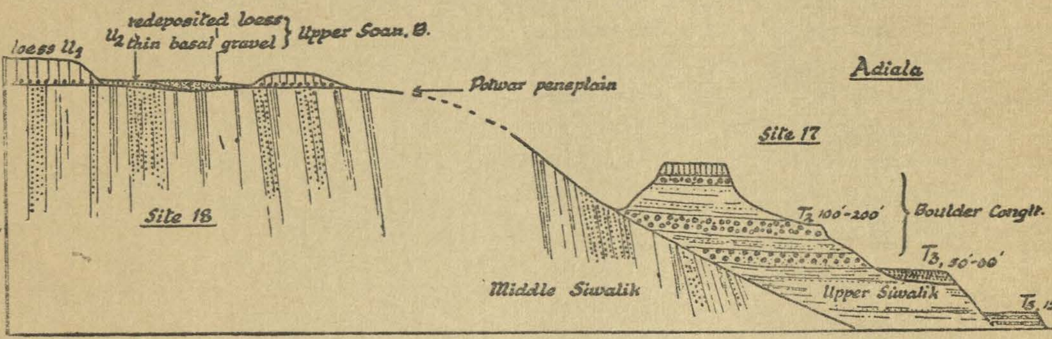
Site 16, Sud.



Site 15, Hun.

Two miles upstream from Site 15 the terraces rise to normal heights, T_2 at 120 feet, T_4 at nearly 40 feet. T_3 is not in evidence. Compact Boulder Conglomerate forms the base of T_2, but the grey gravels of third glacial age, so well preserved at site 15, are absent. On the surface of the Boulder Conglomerate Upper Soan artifacts are found unworn, suggesting their covering by loess, from which they were later exhumed still in place. A basal Potwar gravel is absent, but is represented by a pinkish sand which is overlain by loessic silt with a three foot "pan soil" layer. From the sand come a few greenish quartzite flakes of Moustierian type.

Site 17, Adiala. Village 73°00′E., 33°27′N. Fig. 15.



Composite section of Sites 17 & 18, Adiala.

Towards Adiala on the west bank of the river, vertical Middle Siwalik beds are exposed and against them an Upper Siwalik series is banked, the junction showing a marked unconformity. The Pinjor series passes up conformably into the Boulder Conglomerate which, in this medial portion of the Soan Basin, is thickly developed and carries intercalated pinkish sands and silts. The upper conglomeratic layers are well seen on the track northwards from Adiala to Misriot as it rises to the peneplain one and a half miles north of Adiala. From the Conglomerate, and in place, a heavily worn pre-Soan flake was extracted.

One mile to the west of this site, one and a half miles north west of Adiala, on the Khassala Khan-Misriot track (72°58′E., 33°27′N.), and about 100 feet above the river, an upper level of the Boulder Conglomerate forms a wide ledge or terrace level (*see* Pl. XXVIII, No. 1, de Terra and Paterson, 1939). On this were found worn Middle Soan artifacts and fresh Upper Soan 1A.

Site 18, Adiala. 72°58′E., 33°28′N. and 72°58′E., 33°29′ 30″N. Fig. 15.

This includes a group of three sites. Two, separated by about 300

yards, lie nearly a mile due north of Site 17, close to the junction of the Adiala-Misriot and Khassala Khan-Misriot tracks. The third, about one and a half miles still further north, is near the Misriot track south of Hassan Khan Dhok, 500 yards north-east of a prominent tank. The first two sites are the most prolific found in the Soan valley. De Terra records some 600 artifacts from about 3000 square feet at the first mentioned site (*see* Pl. XXVI, No. 1, de Terra and Paterson, 1939)

These workshop sites had apparently been founded on outcrops of the upended Dhok Pathan conglomerates, which supplied most of the raw material in the form of well rounded quartzite pebbles ranging up to six inches in diameter. This selection seems to have been deliberate, directed towards the production of the smaller tools of the later Soan, for exposures of the Boulder Conglomerate, not far distant, could have supplied the larger elements which were favoured by earlier "Soan" peoples. The surface gravels, derived from the Dhok Pathan conglomerates, pass laterally into a thin gravel, (one to three feet), basal to a pink loamy alluvium, both apparently residual and local slope-wash derivatives of the Loess, which is widespread on the Potwar peneplain. Artifacts are also found in the alluvium itself. De Terra tentatively correlates this alluvium with the silt of terrace T_4, that is, of fourth glacial age. But most of the artifacts show faint wear, some with a kind of desert polish, contrasting with the freshness of the industries of sites 7 and 8, which are always on the top levels of rewashed silt or Potwar where these occur in the neighbourhood. Hence it is reasonable to assume that the loamy alluvium of this site is of third interglacial age, corresponding with the gravels and silts of terrace T_3. The sequence would then be:—

(a) Deposition of Potwar Loess on unpatinated gravels as at Sites 7 and 15.

(b) Erosion of Loess and exposure of Dhok Pathan conglomerates providing raw material; redeposition of loess-alluvium; with the industry in basal gravel and in the alluvium.

(c) Surface washing of re-deposited alluvium, again exposing the Dhok Pathan and imparting faint wear and patination to the artifacts.

(d) Manufacture of the Final Soan, now in fresh condition, as at Sites 7 and 8.

(a) would then be of phase u_1, (b) of phase u_2, and (c) and (d) of phase u_3.

Site 19, Morgah. 73°05′E., 33°32′N.

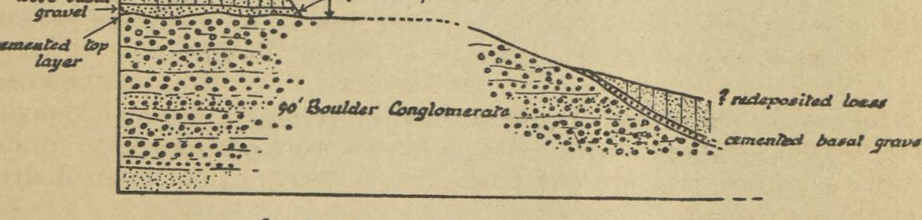
About four and a half miles south-south-east of Rawalpindi Cantonment the hamlet of Morgah lies on a terrace about 100 feet above the river. Around the oil refinery there Dr. E. B. Pinfold discovered a large number of artifacts, chiefly bouchers, which are found loose on the surface of, or embedded in, a cemented conglomerate.

Farther downstream, for example at Sites 14 and 15, conglomerates and gravels of third glacial and third interglacial age are exposed; and they can be distinguished for the earlier is loose and sandy and the later is gravelly, thinner, and cemented. There are also a lower terrace about 40 feet, and a wide terrace flat at 15 feet on the big river bend south of the Grand Trunk Road bridge. On these counts it is presumed that the cemented gravel here is of third interglacial, phase u_2, age. Such a finding is supported by the evidence of typology, for the slightly worn series from Chak Sighu, Site 14, from the same conglomerate, matches the Morgah collection in detail.

Site 20, Kotah. 73°06′E., 33°33′N.

This site is not palaeolithic, but is inserted since the industry will be described as a Neolithic survival. It is a surface site found close to the village of Kotah, just west of the loop of the Soan at milestone 166 on the Grand Trunk Road, a mile south of the Attock Oil Company headquarters.

Site 21, Grand Trunk Road, Kund. 73°08′E., 33°32′N. Fig. 16.



Site 21, Grand Trunk Road.

There are several exposures on either side of the Grand Trunk Road near milestone 163. At least 90 feet of Boulder Conglomerate can be seen carrying well-rolled, far-travelled pebbles up to four inches in diameter, and interspersed with beds of pink silt and sand. The topmost

level is cemented hard with calcareous interstitial matter and in this have been found worn bouchers of Middle Acheul type, and a few very worn flakes which may be pre-Soan.

Immediately on top of this cemented layer lies a thin band of loose, clean, unpatinated gravel from which were taken fresh artifacts of Upper Soan A types. Where the surface of the cemented layer is exposed by denudation similar tools lie open on the remains of this loose gravel. Potwar Loess, forty feet thick in places, lies on top and from its lower part (at no particularly discernible level), perfectly fresh Moustierian-type artifacts can be extracted.

About half a mile south west these deposits are cut into by ravines partly filled with redeposited Loess overlying a thin, patinated gravel, cemented hard. Here have been found artifacts which are Upper Soan in type. This would be consistent with a dating of the redeposited Loess as phase u_2, and in this Pere Teilhard de Chardin agreed during discussion with Paterson in the field. On the other hand, Dr. de Terra, (de Terra and Paterson, 1939, p. 283), regards it as Potwar of the same age as that on the elevated peneplain. Apart from the topographic and lithological distinction of the two basal gravels, there is further evidence in the patination and lime cementation of the Upper Soan A artifacts. These, exposed on the Boulder Conglomerate surface after Potwar denudation, contrast with the cleanness and freedom from calcareous matter of pieces in situ in the basal gravel of the Loess proper. Presumably the patination and encrustation are the result of the same conditions which led to the cementation of the basal gravel of the redeposited Loess.

Site 22, Mangot. 73°15′E., 33°29′N.

This is a site found by de Chardin and de Terra and described by the latter as Malakpur, (op. cit. p. 283). It lies about two thirds of a mile north of the village of Mangot, one and a half miles from Manihiala railway station (*see* Plate XXVII, 3, op. cit.). The relationships are much the same as at Site 21. Between 20 and 30 feet of Potwar Loess overlie a loose basal gravel, (which in this case may attain a thickness of 12 feet, with pink sands), resting on uncemented Boulder Conglomerate. Where this last is exposed a few well-worn pebbles were found, believed to be pre-Soan. In the basal gravel many Upper Soan A artifacts were discovered.

Site 23, Gujar Khan. 73°18′E., 33°17′N.

This site was not visited by the writers, but it is described by de Terra, (op. cit., p. 294). Two miles north of Gujar Khan, and nearly

two miles east of milestone 144 on the Grand Trunk Road, a small tributary of the Khansi River, the Hachiari Nullah, cuts into an anticlinal ridge of Upper Siwaliks running north-north-east. Third glacial erosion has cut a terrace level out of the second glacial conglomerates, sands and silts which dip south-east. Unconformably and horizontally on this lie 10-12 feet of Loess with a loose basal gravel. Both Loess and gravel yielded flakes and cores, and in the Loess were found fragments of fossil turtle eggs and *Bulimus*, but no fresh-water shells.

Site 24, Kallar. 73°26′E., 33°27′N.

The south-south-westerly course of the Khansi River is controlled by a series of early Middle Pleistocene anticlinal ridges between which it runs, and into which it has incised its course since late Middle Pleistocene times. These ridges can be followed upstream to the town of Kallar, where they become higher and more prominent. Four miles north-east of Kallar, behind the hamlet of Jochha Mandot, a ridge attains a height of 300 feet above the surrounding Conglomerate-strewn Potwar peneplain. The ridge exposures are entirely in the skin of Boulder Conglomerate, which represents a westerly extension of the Jhelum fan of that period. In it was found a very large, worn, pre-Soan flake.

Site 25, Chaomukh. 73°44′E., 33°16′N.

On the east bank of the River Poonch, one and a half miles downstream from Chaomukh, a small tributary enters the main river from the direction of Mirpur, the Chaomukh-Mirpur road following its course to some extent. On the south side of this small stream the banks show a series of second interglacial, well-bedded gravels and sands, slightly warped, and derived from the typical Boulder Conglomerate which, tilted at an appreciable angle, can be seen a little to the north. Cut into this are lenses of conglomerate, which are separated from the overlying Potwar Loess by an erosional surface. A few artifacts, believed to be Middle Soan on account of their simplicity and stratigraphic position, were taken from the second interglacial beds.

The terrace sequence of the Soan is almost identical with that of the Indus, Fig. 7, but the number of sites, especially of Upper Pleistocene age, greatly extends the Palaeolithic picture. The reason for the difference in industrial distribution of the two river systems is discussed later.

Away from regions of tectonic disturbance the terrace heights and structure are constant but, as in the Indus valley, there are places where

the sequence is disturbed, as around Site 13. There the late Pleistocene warping and uplift localised within the Soan Basin has altered the height relations of terrace features.

The following table lists twenty five sites which yielded assemblages of artifacts in situ and in numbers sufficient to admit of classification within the Soan cultural sequence. The type of industrial assemblage found, and the state of wear are given for each site; and the specific site assemblages chosen as representative of the various stages of Soan cultural development are indicated.

TABLE I

Sites, Assemblages and Described Assemblage

Site No.	Place	Assemblage	Described
1	Gariala	Battered pre-Soan, worn Stellenbosch.	..
2	Shadipur	Fresh Lower and Middle Soan.	..
3	Jalwal	Worn pre-Soan, fresh Lower and Middle Soan.	Pre-Soan,
4	Khushalgarh	Worn Lower Soan, fresh Middle Soan.	Lower Soan,
5	Makhad	Worn pre-Soan, fresh Middle Soan.	Middle Soan.
6	Injra	Worn and fresh Lower and Middle Soan.	
7	Dhok Pathan	Fresh final Soan.	Final Soan.
8	Pindigheb	Fresh final Soan.	Final Soan.
9	Ghila Kalan	Worn pre-Soan, fresh Upper Soan A, Upper Clacton A.	Upper Soan A.
10	Balawal	Worn Stellenbosch.	..

11	Balawal	..	Worn Middle Soan, fresh Upper Soan A.	..
12	Sihal	..	Worn pre-Soan, fresh Upper Soan A.	..
13	Duliali	..	Worn pre-Soan. ..	..
14	Chak Sighu	..	Worn Middle Stellenbosch, fresh Upper Stellenbosch.	Upper Stellenbosch.
15	Hun	..	Fresh Upper Clacton A. ..	..
16	Sud	..	Worn Middle Soan B. fresh Upper Soan A.	..
17	Adiala	..	Worn pre-and Middle Soan B, fresh Upper Soan A.	..
18	Adiala	..	Fresh Upper Soan B ..	Upper Soan B.
19	Morgah	..	Fresh Upper Soan Stellenbosch.	Upper Soan Stellenbosch.
20	Kotah	..	Post Palaeolithic ..	..
21	Grand Trunk Road		Worn pre-Soan and Middle Stellenbosch, fresh Upper Soan A and Upper Clacton A and B.	Upper Clacton A and B.
22	Mangot	..	Worn pre-Soan, fresh Upper Soan A.	..
23	Gujarkhan	..	Fresh Upper Soan and Upper Clacton A and B.	..
24	Kallar	..	Worn pre-Soan. ..	..
25	Chaomukh	..	Fresh Middle Soan. ..	..

CHAPTER III

THE SOAN CULTURE AND CLIMATE

The findings of the previous chapter are summarised in the idealised composite section, Fig. 2; and the horizons at which artifacts have been found are indicated. In accordance with the system proposed by Paterson in a previous publication(1), the groups of artifacts and industries coming from phases m_1, m_2, u_1 and u_2 and u_3, have been named Lower, Middle, Upper and Final Soan respectively.

The great majority of the collections were made on the river terraces, the exceptions being the Final Soan from the Pindigheb and Dhok Pathan sites which, however, are not far removed from the river, and were possibly workshops on outcrops of suitable raw material. The movements of various members of the expedition took them frequently across open country and only one find, a flake, was then made. This was at Kallar, a site near which the river must have flowed at the time the flake was made. This congregation of sites along river valleys suggests that in these parts food was more easily obtained and more habitable grounds were to be found.

Whether we may also infer from the distribution that the Soan culture people kept to the rivers for purposes of fishing is debatable, but comparison with modern barbaric communities would support such an inference. Moreover, as will be shown in a later chapter on palaeoethnology, some tool forms imply techniques of wood or rattan stripping, splitting and scraping, possibly for the making of fish and other traps.

From the Indus terraces come most of the Lower and Middle Soan tools, but a few derived implements were found in the later gravels along the Soan. No actual working floor of these earlier forms was found in either area, though the great majority of artifacts were concentrated near Khushalgarh and Shadipur on the Indus. Their scarcity, despite intensive search by all members of the expedition, contrasts with the comparatively prolific occurrences of Upper Soan age along the River Soan. This may be explained by the limited extension of the Upper Pleistocene terraces, hence concentration of population, as against

(1) Paterson T.T.: "On a World Correlation of the Pleistocene" Trans. Roy. Soc. Edin., Vol. LX, 1941, pt. II.

the great extension of the depositional and erosional terraces of the Middle Pleistocene over which Lower and Middle Soan men could distribute their workshops and settlements. On the other hand a difference in population may have been the basic cause of the contrasts.

The earliest artifacts, large massive flakes and simple pebble tools, are found, heavily worn, in and on Boulder Conglomerate of the high depositional surface. It is possible that these artifacts were derived from Lower Pleistocene deposits but, in accord with the conservative attitude deliberately adopted in this work, great antiquity is not claimed for these tools, and they are regarded as earliest Middle Pleistocene in age.

The other artifacts of Middle Pleistocene age can be divided into three groups, Lower Soan and Middle Soan A and B. The earliest, *Lower Soan*, comes in a fresh condition from the highest levels of the Boulder Conglomerate, and in a worn condition from the erosional slope E_1; that is to say, they were probably made at a time when deposition of the Boulder Conglomerate was slackening. Patination is dark brown or purple. The second group, *Middle Soan A*, is similarly patinated and coloured, but unworn; it is found on the Conglomerate surface and on the slope of the E_1 stage of erosion leading to terrace T_1, that is, dating from the beginning of phase m_2.

This very distinctive, deeply coloured patination is never found on artifacts of the Upper Soan, late Pleistocene in age, and is most striking when seen on derived pebbles in "clean" bouldery gravel of third glacial times. It is believed that this patination was developed in phase m_2 during a climatic stage of hot seasons alternating with heavy monsoon rain periods, and separating in time Middle Soan A and *Middle Soan B*. The latter group of artifacts is fairly fresh in condition when found in the redeposited gravels of terrace T_1, but worn in the third glacial gravels of T_2.

Another indication of the great age of the Middle Soan is the amount of chemical corrosion which has affected even the hardest of the quartzites, and which is never seen on artifacts of later age. On one Middle Soan B specimen of quartzite this corrosion has affected the worked area, but not that part protected by the heavy patination of earlier m_2 age. It seems that this patination is the result of a chemical process somewhat similar to that of lateritisation in being replacement of the alumina leaving a more resistant and deeply coloured skin, literally a "cuirasse de fer".

In the Upper Pleistocene the Soan industries are again apparently confined to deposits which indicate a more equable climate than of

today in that they show the precipitation to have been probably greater. *Upper Soan A* occurs in the gravels of third glacial age and in the occasionally cemented finer gravels which lie immediately on top, these being part of the basal portion of the Potwar Loess. The cementation is a result of the drier conditions associated with the Potwar Loess which is essentially an aeolian formation though water-laid in part. In the Loess the Soan proper disappears and its place is taken by a Moustierian-like industry, whose manufacturers were probably adapted to more open country. Presumably even they could not tolerate the dessication of the Loess times, for their industries are not found in the upper parts of the Loess.

With the onset of damper conditions at the beginning of phase u_2 the Soan people returned to their former hunting grounds, their stone industry having undergone but little development into *Upper Soan B*. Again drier conditions set in with cementation of gravel and the re-deposition of the Loess in the valleys and nullahs eroded during the damper stage. The Loess was also re-sorted on the higher plateau levels and covered the Upper Soan B working floors. These were sited near sources of raw material (generally Dhok Pathan conglomerates) suitable in size for the smaller types of tools then made. The drier conditions led to "desert polishing" of some of the Upper Soan B artifacts, where these were exposed. No implements are found in the re-deposited loess and presumably the Soan peoples were again driven from the area, probably migrating southwards into the Peninsula as we hope to show in a later work.

The fourth glacial stage, phase u_3, brought an amelioration of the climate and with it a return of the Soan emigres, their artifacts now reaching, in the *Final Soan*, the limit in small size and fineness of flaking for their particular types of tools.

CHAPTER IV

TERMINOLOGY

Archaeological expeditions are digging in new regions, discovering new industries and new cultures. In the older, classical regions intricate subdivisions of culture are being established. Names are being spawned without regard to any rational system of nomenclature and chaos must inevitably be the result. We here present the justifications for the terminology we employ.

A. The Terminology of Culture

Three styles (not systems) of nomenclature have been in use:

(a) Names established in one region have been applied in another without qualifications which would indicate regional differences. For example, a series of industries in Africa has been called Levalloisian though they carry elements which do not appear in the original European Levalloisian culture. The presence of the Levalloisian *Technique* is rightly implied but qualification is necessary to show cultural dissimilarities. It is in such a circumstance that the introduction of new names may be useful. An advantage of retention of names is that impressions of new cultures can be given even though the impressions may be somewhat inaccurate.

(b) A cultural series of industries, though carrying a dominant element like that in a culture already described, may receive a name, which is new to prehistory—for instance the Stellenbosch of South Africa, which carries a large Acheulian element. One disadvantage of this method is that the names are multiplied without relationships being indicated. Another is that the geographical names are occasionally overlong and sometimes unattractive, *e.g.* Leopoldvillian.

(c) A cultural variation may be expressed by the attachment to the cultural name of a specific qualification, often geographical. This style has been adopted by Leakey in East Africa and is useful, provided it is understood that the geographical qualification has a cultural as well as a regional implication. In essence it is a binomial system of nomenclature.

The binomial system has been applied to Homo sapiens as a member of the mammalian phylum. Homo has been subjected to the same changes of environment that brought about the development of other mammalia, and there is evidence that he reacted in analogous fashion. As the bony remains of fossil horses, elephants and camels reflect the development of their soft body parts so through fossil human bones can be traced the development of man's physical characteristics. It may be argued therefore that in man's industries and cultures, the product of his mental processes, we can see the development of the mind that conceived them. *It follows that a binomial nomenclature should be applied in prehistory if possible but, until more evidence on the relationships between skeletal and cultural remains is obtained, it does not follow that "generic" and "specific" cultural distinctions imply corresponding anthropoid distinctions. **

Should a binomial system be applied some rules or principles must be adhered to:

(1) The name must indicate group relationships.
(2) The broad or "generic" name should be confined to cultures, groupings of industries*** related in form, technique, time and space.
(3) The dominant element in industry is the basis for establishment of *inter*-cultural relations, hence that dominant element decides the "*generic*" name which expresses *cultural* similarities and differences.
(4) Minor elements in industry are the basis for establishment of *intra*-cultural relations, hence the minor elements decide the "*specific*" name which expresses *industrial* similarities and differences.
(5) Should an industry be found to show unique or very peculiar characteristics then the "specific" name should be qualified by "industry". If the industry later turns out to be one of several which constitute a culture then the qualification can be dropped.

* Such an argument has its weaknesses, and its justification falls outside the scope of a book on regional prehistory. But it has already been shown that, in the earlier periods of the palaeolithic, cultural distribution was similar to distribution of physical types. Paterson, T.T., Geology and Early Man, Nature, July 1940, p. 15.

**Particular note must be made of this implication. Cultural elements and ideas may be diffused by culture contact without our necessarily assuming the diffusion of the people who originated the elements and ideas.

***An industry is a collection of artifacts found in such close association as to suggest their manufacture by a single human group over a period of time which may be regarded as geologically contemporaneous.

(6) A further classification would be obtained if the "generic", that is the cultural, name be substantival, and the "specific", that is the industrial, name be adjectival.

The circumstance under which a new name for a culture can be justifiably introduced is expressed in numbers (2) and (3) of these principles of nomenclature. A culture may be found to have resemblances to another elsewhere but where the local elements are strongly developed, especially if preponderant, then a new "generic" or cultural name can be applied. For instance the Soan Culture of India carried in its early stages a simple flake element, and in its later a more complex, the so-called "Levalloisian", but strongly marked and consistent throughout is a pebble element which, in most of the Soan industries, is dominant. Hence a reason for the introduction of the word "Soan".

It may be that industries require special recognition. If this is necessary the recognition should be in the form of a name attached as a "variety". For instance the Sholavaram industry of Madras would be called the Indian Acheul of Sholavaram.

There are certain further points, regional connections, autochthony and homotaxis which must be referred to.

An industry may be discovered closely similar to another very distant from it. For instance, a microlithic industry in India may be very like another in Europe, or the South African Stellenbosch may have close parallels to the early palaeolithic in Peninsular India. It is then inadvisable to use exactly the same name for both unless a direct relation can be established by distribution patterns. A qualifying term, preferably regional, should be used until the direct relation can be established when the qualifying term can be dropped.

In the above paragraph the implication is that since there is similarity then there may be connection, and only the "specific" name requires a cautionary qualification. That is to say only diffusion has been suggested to account for similarities. However, it must be borne in mind that among primitive cultures, especially when raw materials are the same, there is a possibility that *autochthonous development* under like conditions may produce like industries or cultures. Likewise convergent development must be considered, for it may be that two closely similar industries are not immediately connected and belong to different cultural streams of development, perhaps related at an earlier period though the intervening stages in each stream are dissimilar—*homotaxis*.

Should a case of convergent evolution be established then the "generic" name could be raised to the status of "family" name and the "specific" qualification would become "generic". Should a case of autochthony be established then both "generic" and "specific" names could be made dissimilar. A "varietal" name could indicate the similarities. Since it is unlikely that such cases will be discovered until much more research has been done, difficulties on these grounds will not arise for some time; but it must be remembered that no system of nomenclature is rigid and, if necessary, names can be changed.

B. The Terminology of Technique

When the student of the Palaeolithic turns his hand to the practice of the techniques he studies he will become aware of some points which are important to his appreciation of palaeolithic culture. If he attempts to make an "Acheulian hand-axe" he will be fortunate, or extraordinarily skilful, if he can fashion during his first day's work an artifact as good as a Middle Acheulian type. His first attempt will be as crude as the "Chellian". He would thus recapitulate the development of form and technique as he progresses to mastery of pressure flaking, (under tutelage it is presumed, since even the highly skilled Brandon flint-knappers could not independently conceive the fine, wood and bone pressure-flaking technique of the Upper Palaeolithic artificers).

If he is working on big blocks of stone he generally knocks off a large piece, reduces it by free flaking roughly to the required size and shape, and then proceeds to his developed secondary working. Unless he has been taught to do so by word of mouth or by visual example he will not be likely to think of preparing a core from which to strike a flake so preformed in thickness, shape and size as to be suitable to his purpose. Apart from thus appreciating the conservative nature of a stone artificer he will learn that the workman of his experience no longer makes a stone tool or weapon but a stone shape, a form; he sees in his mind's eye the form of tool he requires, without thinking how that tool is to be used or of its associations with other artifacts; and he will learn that his technique is no longer definitive "free flaking" or "pressure flaking" carefully thought out for each stage and situation in manufacture, but an automatic process; he works with a technique which he finds requires an effort of will to alter. He has developed two habit conceptions (of form and of technique) in learning to make the artifact.

In the study of modern material culture each material element must be regarded from four aspects, its form, its method of manufac-

ture, how it is used, and its social implications. To the mind of the individual member of the group practising the culture these four aspects are not readily apparent nor indeed, unless he deliberately thinks it over when demanded of him, does he appreciate that they form a series of linked elements of culture forming a culture complex. The ethnologist describes his material in terms of shape, technique or utilisation. Thus he may describe a basket either as a round basket, a 'mad-weave' basket, or a seed basket. The prehistorian uses all these methods when he talks of a point, a biface, and a scraper. He cannot study the social implications of stone artifacts since he has little or no evidence thereof. Nor, in the great majority of cases in the Palaeolithic, can he be definite about utilisation. Thus he finds himself reduced to using essentially form-technique association in his descriptive repertoire, that is, the two basic habit conceptions of the stone artificer.

It is the persistence of these form-technique associations, distributed chronologically and spatially, which constitute *traditions* of technique as applied to the production of forms; and from such traditions the conceptions of culture complexes or, shortly, cultures are built up. For instance the occurrence at various levels, and in different areas, of the cleaver form and its accompanying Victoria West technique, constitutes what might be called a cleaver tradition. The persistent association of this tradition with that of the so-called "Acheulian handaxe" and with some cores and flakes, constitutes a culture complex, the Stellenbosch. Hence the descriptive terminology must, logically, be confined to terms involving shape and technique, except in those instances where there can be no doubt as to the method of utilisation.

Accordingly 'hand-axe', 'cleaver', 'adze', 'chisel', 'wedge', 'scraper', and such like terms should be discarded, though some may be retained provided their implication is purely that of form. Thus 'cleaver' conjures up a form with sharp terminal edge produced by the intersection of two large flake surfaces, a typical form-technique association. Whereas 'adze', 'chisel', and 'wedge' imply utilization as well as form, but not technique. They require the hyphenated addition of '-shape'; the implication of specific utilisation must be discarded, and that of form alone retained before they can be of descriptive value.

'Hand-axe', or 'coup-de-poing', implies utilisation alone and is thus a most unsuitable word. Moreover it implies utilisation of a kind which is not certainly correct. It can be imagined that an "Chellian" tool might have been held in the hand with the unworked portion as a butt and the worked portion used as a point, but not used as an axe as we understand it today. Perhaps it was employed as a very elementary stabbing weapon. The "Acheulian hand-axe" was probably hafted; we

cannot believe that the very sharp edges of the worked butt-end were easy to manipulate. Nor can we believe that the thin tapering points of "Upper Acheulian hand-axes" could have been used for chopping or breaking. The cleaver on the other hand could, more justifiably, be called a hand-axe. In the very late stages of "hand-axe" development the square-butted pyriform type was possibly used as an axe, for there the butt becomes the functional end, and the pointed end was probably hafted (either due to a mutation or to assimilation of a Stellenbosch cleaver idea).

For these reasons we have resuscitated the word "*boucher*", the original name for such artifacts. It is derived from the name of the famous French pre-historian of the middle of the 19th century, Boucher de Perthes, whose insistence that these were humanly-fashioned stones first brought the idea of the existence of Pleistocene man into prominence. Such a word has a significance only of associated form and technique, admirably suited to the terminology here suggested.

In the past the boucher was called a "core tool" to distinguish it from flake or blade tools. This leads to confusion with "core" used to describe the nucleus from which the flake or blade is struck. Such confusion is even yet perpetuated despite the general disuse of the term.* There is, however, need for a word to describe a technique whereby a piece is fashioned, as the boucher is fashioned, by striking from both a ventral and dorsal side. This is most appropriately called a "*bifacial*" *technique;* it is used in core-flake cultures as well as boucher cultures. We distinguish the bifacial technique when used in making bouchers as "*boucher technique*".

This requires that care must be taken in the interpretation of the term "Acheulian flake". Apparently such flakes are generally understood to be those struck in the manufacture of Acheulian culture bouchers, but similar flakes can be found in any industry where the boucher is made. And the boucher can be found in neolithic and even later industries. Indeed it has been known for prehistorians to mistake neolithic and chalcolithic flint tools for Acheulian, a mistake in many cases quite pardonable. "*Boucher flakes*" would be a more suitable term.** Where flakes are retouched bifacially they are distinguished as "*bifacial flakes*". Since, in the Acheulian culture, boucher flakes are utilised as

*Movius, H., The Stone Age of Burma, Trans. Amer. Phil. Soc., Vol. XXXII Pt. III, 1943.

**The distinction between boucher flakes and bifacial flakes has been made before by Paterson and Fagg who used the terms biface flake and bifacial flake. The Upper Brecklandian Acheul (Elvedon), Proc. Prehist. Soc. 1940.

tools*, the term "Acheulian flake tools" is permissible, justifiable and suitable.

There can be repeated here, with profit, the description of the types of "boucher flakes" met with in the Acheulian culture.**

(1) Preparatory flakes struck in primary working. They are generally pseudo-pyramidal, retain a big portion of cortex and have large high-angled platforms with biggish bulbs.
(2) Thin flakes produced in secondary working. The thinness lies in the concavo-convex form due to the parallelism of reverse flake scar and flake surface. There is no cortex, the striking platforms are insignificant and the bulbs are somewhat flat.
(3) Small flakes produced in finer retouch. The characteristics are much the same as those of type (2) but generally this type of flake is elongated, with a terminal bulb.
(4) Flakes produced in re-sharpening of the biface edge. They are thin, generally of the size of type (2), but the reverse, or upper, surfaces are composed of flake scars corresponding to flakes of type (3). They are elongated with small, terminal, faceted striking platforms. The faceting is due to the fine retouch in the original making of the boucher.

The term "*cleaver* is applied in this work to an artifact with a straight, terminal, working edge, formed by the intersection of flake surfaces produced by Victoria West technique. When the cleaver end is perpendicular to the long axis of the tool it is said to be "perpendicular", and if not so, "oblique".

Clactonian is another word which has been loosely employed. So-called "Clactonian flakes" with large, plain, high-angled striking platforms can just as well be produced in Levalloisian and Acheulian industries as in Clactonian. Any attempt to manufacture a tortoise core or an Acheulian boucher is convincing enough.

It has been shown***, that the Clactonian culture *sensu stricto* (the Brecklandian) is characterised by a series of industries found in Europe where flakes, struck from prepared cores, are utilised in a group of definite tool forms. The cores are not so finely prepared as in the Levalloisian culture, hence the flakes have, on the whole, plain or "primitively"

*Kelley, H., Acheulian Flake Tools, Proc. Prehist. Soc., 1937, p. 15.
**Paterson and Fagg, op. cit.
***Breuil, H., Le Clactonien, Prehistoire, T.T., 1932, and Paterson, T.T., the Barnham Sequence, Proc. Prehist. Soc., 1937.

faceted striking platforms. It follows that the word Clactonian having a cultural significance implies the presence of the flake types, the tool forms and the prepared cores, not the flakes alone. Because "Clactonian flakes" can be produced in so many kinds of industry it is much easier to misuse the word "Clactonian" than "Levalloisian" to which culture the faceted striking platform is one specific indicator. This same specific character in some ways permits Levalloisian to have a technical significance, but Clactonian cannot be employed in a parallel manner.

Therefore, in order to describe shortly a flake having a plain, or almost plain, high-angled striking platform we use the word "*plain*" for, in general, the plain platform is connected with a high angle between surface and platform. Plain flakes may appear in any culture and are not confined to the Clactonian. Paterson has already enlarged on this matter, and on the use of the word "faceted".*

As with Acheulian and Clactonian difficulties arise in the use of the term *Levalloisian*. It is used either with a cultural or with a technical significance. A "Levallois flake" is usually taken to mean a "flake with a low-angled, faceted striking platform". Such a flake may quite well be produced in a developed Clacton industry** or in boucher technique (type 4), and is widely distributed in time, appearing well on into the Neolithic and even later. Alternatively a more limited construction may be put on "Levallois flake", implying the preparation of a "tortoise core" as the preliminary to the making of the flake. But in either case the impression is that of a technical process, not necessarily as a cultural element.

For instance, the name Levalloiso-Moustierian has been used. To a reader ignorant of Palestine prehistory, there are three possible constructions which can be put upon this.

(a) A Moustierian culture with faceted striking platforms and tortoise cores.

(b) A dominant Moustierian culture in contact with a Levalloisian culture.

(c) A dominant Levalloisian culture in contact with a Moustierian culture. In case (a) "Levelloisian" has a technical sense, and in the others, cultural.

*Core. Culture and Complex, Proc. Prehist. Soc., 1945.
**Paterson, T.T., the Barnham Sequence, Proc. Prehist. Soc,. 1937.

Again, the Stellenbosch of South Africa is said to be made up of "Acheulian, Levalloisian, and Clactonian". Here the implication is that a Levallois technique is present, with faceted striking platforms and tortoise cores. Whereas if the word "Levalloisian" had been qualified by another such as "early", which is only used in time or cultural contexts, then Levalloisian could only have had a cultural significance. That is the Stellenbosch would have been a mixed culture of Acheulian, Levalloisian and Clactonian cultures (presuming "Clactonian" is used in its cultural sense).

The difficulty lies in the failure to recognise that the classic, or European, Levalloisian culture has to be defined in terms of flake and core forms, tool assemblages and industrial variations. Wherefore Levalloisian can only be used in a cultural sense, and another term has to be used for the flake with the low-angled, faceted striking platform and hence for the technique of its production. Another disturbing position will appear when the proto-Levalloisian culture is discovered, and it will be difficult to draw the line between faceted and non-faceted striking platforms; Levalloisian in the cultural sense could be applied to an industry of this kind with no faceted striking platforms.

The extreme in confusion of terms is to be seen in the following "Lower Palaeolithic horizons in other sections of the Old World. . . . yield both true hand-axes ("coups-de-poing" or "bifaces") and Levallois flake tools. Except on the extreme northwestern periphery of their distribution—*i.e.* France and England—these two types of *implements*, sometimes considered to be mutually distinct *industries*, cannot be segregated as separate and independent developments. Indeed the distribution of those which are in the so-called Levallois tradition closely follows that of true hand-axe *complexes* of developed Acheulian type".* The italics are ours.

It is here suggested that a flake with a low-angled-faceted striking platform should be called simply a "*faceted flake*", and the method of preparation, "*faceting technique*".** To prevent confusion a faceted platform flake of boucher technique, type 4, should be called a boucher faceted flake. The term faceted flake has the advantages that it is short and descriptive, it can be used throughout a wide range of time and culture change, and it contrasts with the term "plain flake" already described.

*Movius, H., The Stone Age of Burma, Trans. Amer. Phil. Soc., Vol. XXXII, Pt. III, p. 377.

**Paterson discusses this at greater length in "Core, Culture and Complex", Proc. Prehist. Soc., 1945.

To talk of Levallois culture because of the presence of faceting technique is not sense. There is no reason to believe that faceting technique could not appear in any cultural complex from late Middle Pleistocene times onwards where suitable raw material is available. Indeed it is the case that faceting technique appears in almost all developed Acheulian and pebble-flake industries in Europe, Africa and Asia, as well as in the Levalloisian, Moustierian and Brecklandian of Europe. Van Riet Lowe has emphasised this in descriptions of the evolution of faceting technique in South Africa.*

We emphatically agree with him that there is no sign of the Levallois culture in South Africa. But he goes too far when he says, "Where 'Clacton' and 'Levallois' elements occur outside the regions mentioned (England and France), but especially in Quaternary deposits in Africa and Asia, these elements are, in their inception, by-products or waste products of the Hand-axe Culture of Chelles-Acheul facies: the by-products being implements such as scrapers or flakes with or without faceted platforms, the waste products being the specially prepared cores".

Faceting technique appears in Asiatic industries where there is no evidence whatsoever of Acheulian influence. And the faceted flake tools are not by-products. They are clearly elements of the complexes that make these industries cultures in their own right; just as they are not by-products in the Acheulian cultures but are distinctive of these cultures. One need but see a collection of cores from a non-boucher site to realise that these cores were intended for the production of flakes, and are not the waste products of boucher techniques. To take the simplest case, an asymmetric core: there is no possibility that this is a boucher waste product; flakes and flakes only were sought. It would also be hard to believe that, in well-known open-station floors of flake-core assemblages where not one trace of boucher technique has been found, the accumulation of obvious tools was a by-product. Are we to assume that palaeolithic man in these cases carefully removed every vestige of boucher technique and left only flake tools? It cannot have been a boucher factory with so many tools around. Perhaps these were sites for particular seasonal occupations where only flake tools would be used. Nevertheless, we cannot explain the absence of bouchers in shelters, presumably home sites, where the true Moustierian floors yield no bouchers—except in contact. The absence of Levallois culture in South Africa is no guarantee of its absence elsewhere, but is symptomatic; the Levallois culture did not extend to South Africa, probably not even beyond Western Europe.

*Van Riet Lowe, C., the Evolution of the Levallois Technique in South Africa, Man, No. 37, 1945.

CHAPTER V

SOAN TYPE TOOLS

In the preceding chapter we concluded that "descriptive terminology must, logically, be confined to terms involving shape and technique, except in those instances when there can be no doubt as to the method of utilisation". Since we cannot be certain of the method of utilisation of the Soan Culture tools, we must use a form-technique nomenclature.

The outstanding feature of the Soan Culture is the use of pebbles. This may have been the result of limited sources of raw material for, in the Soan basin in particular, there are no outcrops of native rock suitable for tool-making, and in the Indus basin the only outcrop is limited in distribution and distant from the river terraces where Soan man appears to have found his livelihood. It is to be expected that he would use the local raw material, river-worn quartzite pebbles of which there was abundance.

The tools fall into three groups—pebbles which are split and subsequently trimmed unifacially, pebbles which are not split and are unifacially worked, and pebbles which are not split and are bifacially worked. To distinguish these groups we have applied three simple names with obvious descriptive association:

A	*Flat-bases*	..	pebbles split then unifacially worked.
B	*Oblates*	..	pebbles not split, unifacially worked.
C	*Nucleates*	..	pebbles not split, bifacially worked.

The name nucleate is used because of the similarity of these tools to cores, about which we propose to say more later in this chapter.

A. Flat-Bases

Such tools have a flat or nearly flat surface opposed to a rounded, cortical one being part of the original pebble surface. Some of these pebbles show clear evidence of having been broken by the so-called "bi-polar" technique which is typical of the earlier finds at Chou-koutien. The pebble to be split is placed upon another as an anvil and a third is used as a hammer. The flat surfaces, without marked cores or

bulbs, which are illustrative of this technique, show fracture lines radiating from the opposing points of hammer impact and of anvil contact (cf. Fig. 21b, p. 125). It is thus very difficult to distinguish this kind of fracture from that due to natural percussion in a river bed, the more so when, as is very frequent, no lines of fracture are to be seen. We must assume, because of this, that the flat base may have been produced either naturally or artificially.

From this flat, natural cleavage, or artificially fractured surface, flakes are struck off steeply towards the rounded surface at an angle between 60° and 80° to the base. The result is a strong working edge, usually convex, sometimes straight, but seldom concave in the Soan Culture. This flaking, always in *one direction* from the flat surface, was free and probably done with a stone hammer. It is possible that some of these artifacts may have been intended, in the first instance, as cores for the production of small flakes. In many cases, however, the flakes would have been too small to have been of any use as implements; and in many specimens the presence of small but deep, step flaking of the edge shows that they have been subjected to further working and retouch to adapt them for use. Accordingly, all these artifacts are regarded as essentially tools.

The flaking may be continued partially or completely round the edge of the flat base and, depending on the original form of the pebble, the tools may be circular, oval, or boat-shaped. The flat-bases are of three Types:—

Soan Type 1. Terminal flat-base. Fig. 17, 1.

A roughly ovoid pebble with a flat base parallel to the main axial plane, is steeply trimmed along one end perpendicular to the long axis, either by free flaking, or step retouch. This working edge is more often straight, but may be convex. Infrequently the opposite end may be trimmed as well but then from the opposite side.

Soan Type 2. Unilateral flat-base. Fig. 17, 2.

An elongated ovoid pebble, split parallel to the long axial plane, is trimmed by free or step flaking along one side continued sometimes round one end, infrequently around both.

Soan Tpye 3. Bilateral flat-base. Fig. 17, 3.

This is similar to Type 2 but flaked along both sides, forming points at each end, the result being a distinctive "boat-shaped" artifact. Where

the pebble is more spheroidal in shape, it is flaked all round the periphery and the result is blunted—cone in form. Free flaking is usually employed, and at the edge some step flaking, which may be the result of utilisation or sharpening of the edge after use.

The flat-base is essentially the same as a flake for both are removed from a parent piece of stone. Therefore a large flake, with cone, bulb and cortical dorsal surface and with unifacial trimming from the flake surface, can be regarded as a flat-base. Such large flakes appear in the earlier Soan and are classified under flat-base Types, cf. Fig. 28 f, Middle Soan B.

When flake tools are struck from prepared cores, that is, when the dorsal surface is not cortical, they are not so readily classifiable as flat-bases. Such flakes are untrimmed in the Lower and Middle Soan but are trimmed in the Upper and Final Soan; and the working is unifacial being distributed terminally, unilaterally and bilaterally as in the three Types of flat-base. (Concave, notched and nosed working edges are variants of these three Types). This excludes specialised flakes such as the disc core "point" which does not require trimming, or at least very little.

It would be possible therefore to regard flakes from cores (other than the highly specialised) as flat-bases, and to classify them in a similar fashion. But we keep them separate in our descriptions for, as it will be seen, the "flake content" increases with development and therefore the character of the culture alters. Moreover many of the flakes are not trimmed and classification is impossible.

There is no question that Site 1 is the direct progenitor of Site 15. But in the earlier the great majority of "flakes" are struck by bi-polar technique, and in the later the flakes come from pebble, asymmetric and asymmetric biconical cores, and bi-polar technique is missing.

B. Oblates

Such tools are made from pebbles which are oblate rather than ovoid like two shallow saucers placed edge to edge, that is to say offering a natural cortical surface, (akin to the flat cleavage surface of the split pebble tools), from which flakes are *struck from one direction only*. In effect they are treated as flat-based material, but owing to their form the results are different from those obtained in the case of the split pebbles. Since the pebbles are comparatively thin the flakes are struck from the flat basal surface towards the dorsal surface at a considerably lower angle than in the much thicker split pebbles. There are two Types:-

Soan Type 4. Convex Oblate. Fig. 17, 4.

The pebble, circular or oval in outline, is flaked unifacially round half the periphery so producing a convex working edge, Fig. 17, 4b. Sometimes this edge is nearly straight, Fig. 17, 4a, and in closely related cultures (such as the Anyathian) the edge may even be concave. In a few cases the opposing end—or side—of the pebble is worked but from the dorsal surface, in this being parallel with some Type 1 pieces. In the later stages of Soan development the working is sometimes extended all round the periphery, the result being a truncated cone in section, Fig. 17, 4c. These oblates have thus close parallels with the three Types of flat-base, the only difference being that the striking platform is a flat cortical surface and not a cleaveage surface.

Soan Type 5. Pointed Oblate. Fig. 17, 5.

A flat pebble, oval in outline, is worked unifacially on two sides of one end to produce a point. Less pointed specimens are intermediate between this and Type 4. In outline this Type may resemble the early Acheulian boucher differing only in the unifacial working.

In the Upper and Final Soan this Type may show what, at first sight, appears to be bifacial working. But it is essentially unifacial in being struck unidirectionally from first one side then the other, so contrasting with the true bifacial technique which demands rotation between, or nearly between removal of flakes. The technique is more fully described for Fig. 37b, Final Soan.

C. Nucleates

Unfractured pebbles, generally ovoid or slightly oblate, are struck *steeply* from *two directions*, flakes being removed alternately from dorsal and ventral surfaces, the scars of previous flakes being used as striking platforms. This implies that between the removal of successive flakes the tool is turned 180° round the long axis as well as in the equatorial plane, a more developed (nearly bifacial) technique than that employed in making flat-based tools, which do not require rotation other than in the equatorial plane. The edge produced by the intersection of these flake scars is naturally zig-zag or undulating, and is found to be coarser in the earlier stages of the Soan. Uniformity in size of the flake scars on either side, resulting in a symmetrical zig-zag edge, is probably the mark of a tool rather than a core. Where asymmetry occurs, with larger and fewer scars on one side, there is similarity to a core and to preparation of a striking platform. It is possible, indeed, that in their original state these artifacts may have been cores, though this is less likely in

the case of the symmetrical specimens. The great majority, however, show signs of utilisation, or even of actual retouch of the edge, hence they are all regarded as tools, to which, in view of their form, the name "nucleate" has been given.

Soan Type 6. Unilateral Nucleate. Fig. 17, 6.

The undulating edge is confined to one side of the pebble. As explained above this type is regarded as a tool and not as a core, though it is not unlike the pebble core form.

Soan Type 7. Peripheral Nucleate. Fig. 17, 7.

The undulating edge is continued completely round the pebble, usually with cortex remaining in the middle of both dorsal and ventral surfaces. Here occurs the most likely source of confusion with a core, in the simpler cases with a biconical core, and in the case of the more finely worked, later forms, with an unstruck tortoise core. Some may indeed have been cores, which were finally utilised as tools. Others, especially those showing step flaking and battered edges, were almost certainly true implements.

Soan Type 8. The Turtle-back. Fig. 17, 8.

This is an uncommon form of nucleate combining elements of both flat-based and nucleate form-technique association. A circular or oval oblate pebble is split in the equatorial plane and flakes struck off all round the periphery from the cortical across the cleavage surface. In a few cases there is a series of small scars round the edge of the cortical surface, forming a convenient platform for the major working on the opposite face. The final appearance of the artifacts is suggested in the name. The turtle-back may be a core for the production of small flakes, but whereas a core generally shows a wide range of scar sizes, here the range is small and size uniform. The equatorial working edge is therefore also regular.

The Soan Culture also includes *CORES* and the *FLAKES* made from them. The core types are*:—

Pebble;
Asymmetric;
Asymmetric biconical;
Proto-biconical;
Spindle;
Proto-tortoise;
Tortoise; and
Disc.

*For a description of these core types, *see* Paterson T.T., "Core, Culture, and Complex", Proc. Prehist. Soc., 1945.

CHAPTER VI

SOAN OF THE MIDDLE PLEISTOCENE

A. The Pre-Soan. Fig. 18.

The age of these artifacts is not quite certain. They occur worn and water-polished in the Boulder Conglomerate and thus may be either earliest Middle Pleistocene or derived Lower Pleistocene. One specimen found in a vertical exposure of Conglomerate, that from Kallar, Fig. 18c, shows the flake surface smoothed and water-worn, but the reverse has had several flakes struck from it, the scars being fairly fresh. In this case there can be little doubt that the secondary working is contemporaneous with the Conglomerate, that is of the earliest Middle Pleistocene, though the flake itself may be older.

The pieces are very widely scattered and only eight were found, six flakes and two pebble tools. The *flakes* are large, Fig. 18a, with big, plain striking platforms at high angles ranging from 100° to 125°.

They are all of quartzite,* with well-developed cones of percussion, but the bulbs tend to be flat relative to the size. The reverse surface is untouched (unprepared), except in the case of the Kallar specimen already mentioned and figured. *Cores* must be presumed to be simple asymmetric and pebble types. *Retouch* is not readily apparent, for the edges are battered, but whether by a natural agency or through utilisation it is impossible to determine. The *pebble tools* are small, simple, unilateral nucleates, Type 6, Fig. 18b.

On account of their rarity and consequent indefinite "industrial" connotation these artifacts have been called pre-Soan, indicating their chronological rather than their cultural position. The name pre-Soan has been mistakenly assumed by some to imply that these tools are not related to the Soan culture, and it appears necessary to make clear that the chronological significance of the name given to the group does not rule out the possibility of its being related to the Soan. There are not enough

*Except where otherwise stated, all the palaeolithic artifacts described in succeeding pages are made from quartzite or a fine-grained Panjal Trap. Generally speaking the possibilities of the latter rock, which is a much better medium than the former, were not widely taken advantage of until Upper and post-Pleistocene times.

specimens to justify a statement one way or another, and it would be unwise to make one. We believe that it is probable the group does belong to the Soan and might be called Lower Soan A, but we prefer to leave the question open.

B. The Lower Soan. Figs. 19, 20 and 21.

The Lower Soan comes from the first phase of the Middle Pleistocene, m_1. It occurs unworn on the high depositional surface of the Boulder Conglomerate, and is found worn on the slope produced during erosion stage E_1. In both horizons the artifacts are patinated a deep brown or purple.

It cannot be said what single form of tool predominates, since the collection is not large, 48 specimens in all, but Soan Types are by far the most common, mainly Type 4, convex-edged oblate pebbles, and Type 6, unilateral nucleates. All are large and heavy, except for the nucleates which may be as small as those found in the Middle Soan (q.v.).*

The flat-base tools are few in number in comparison with the oblate pebble forms. This contrast is a natural feature of an early stage in development for the direct use of an oblate pebble itself is probably a simpler technique than splitting a pebble prior to flaking it. The two Types mentioned make up about one third of the group. Cores and flakes together make up nearly half of the group, but it is impossible to say which flakes were actually tools for none is re-worked, whereas one can be more sure of functional intention behind the manufacture of the Soan Types.

Soan Type Tools

Type 1. Terminal flat-base: One specimen not figured; now in Delhi.

Type 2. Unilateral flat-base: None was found, but it is likely, in view of the occurrence of the bilateral form, that the Type was in use.

Type 3. Bilateral flat-base: Fig. 21d. The steepness of the trimming, as already mentioned, contrasts strongly with the flatter flaking in the oblate pebble tools, as in Fig. 20a. The tri-

*The largest typical specimens have been returned to the Indian Archaeological Survey. in Delhi.

angular outline is not usual, but the irregular character of the "straight" edges between the points suggests that these edges were not the desired elements, being incidental to the production of the points or "beaks". It is, in effect, a rostro-carinate. In view of this one cannot logically regard it as a good example of the Type, but rather as a cross between Type 3 and the pointed oblate pebble, Type 5. The best typical specimen, half as large again as this, is now in Delhi.

Type 4. Convex oblate: This, the most prominent tool, is figured three times, Fig. 19a and b, Fig. 20a, to show the range covered by the Type. The differences may be in part the result of functional application. Fig. 19b has been battered along its working edge to such an extent that flakes have been riven off, partly obliterating the original flatter working and replacing it with a steeper front. It may reasonably be assumed that it was employed in some kind of pounding operation. On the other extreme Fig. 20a retains its flattened working which is extended farther around the periphery, and shows only slight effects of utilisation. Perhaps it was employed for cutting or scraping, when it might have been used between two hands with a scraping motion. Fig. 19a, like Fig. 19b, is smaller but again worked farther around the periphery; it was presumably used only in one hand, and there are fewer signs of battering. It may have been somewhat pointed, the point being broken off, when its function would have been similar to that of Type 5.

Type 5. Pointed oblate: Fig. 19c. This artifact, bearing a superficial resemblance to a boucher, represents the first appearance of the functional pointed edge in the Soan culture. But whereas in the boucher culture this point form develops into a true boucher, in the Soan culture the point appears mainly on flat-base tools, reverting to the true pebble form again when small points are required and when the raw material demands. Apparently the function of this point was different to that of the boucher.

Type 6. Unilateral nucleate: Fig. 19d. These, almost as common as the convex Type 4, show poor workmanship compared with later forms of the same Type; and also compared with pebble cores of the same age where a similar edge, (though not operational), is the end result. It appears that the function to which this tool was put was in an elementary stage of development,

and not of such importance as the function of the convex Type 4, where the need for a better edge, and an edge with various possibilities, was apparently earlier recognised. From the character of wear on the working edge it seems to have been used in a chopping operation.

Type 7. Peripheral nucleate: None were found, their absence being perhaps related to the poorly developed character of the unilateral nucleate from which the peripheral is probably derived.

Type 8. Turtle-back: These too were absent and probably for the same reason.

Cores

One large, simple *proto-biconical core*, (similar to that figured for Middle Soan A, Fig. 23c), is flattish, with flakes struck from alternate sides all round the periphery, one cortical surface being nearly completely removed. It is now with the Indian Archaeological Survey. Two large pebbles even more simple than the above, with flake scars at intervals, few being used as striking platforms, are akin to *asymmetric* cores. A large *pebble core*, Fig. 20c, shows one flake scar used as platform for the removal of two flakes. Some flakes would show the remains of two scars, Fig. 20b. A *simple spindle-shaped core* was most probably in existence at this stage, for in the succeeding Middle Soan A it has reached a well-developed form, Fig. 24a.

One core was found in significant circumstances, the large *simple proto-tortoise core*, Fig. 21c. It is typically deeply patinated and a dark, brownish purple in colour; it was found along with the fresh, unworn, little patinated Middle Soan B of terrace T_1 at Khushalgarh. It will be observed that the flake removed from this core must have shown two facets on the striking platform and portions of two somewhat longitudinal scars on the reverse surface. No example of this kind of flake was found.

Flakes

Apart from Fig. 20b flakes are thick, with high-angled, unprepared striking platforms, the reverse surface usually cortical, but occasionally bearing the remains of one preparatory scar. Fig. 21a is a smaller example, thick and tabular, with coarse utilisation-retouch along one side forming two or three small notches.

Retouch

There is no retouch worthy of the name, except perhaps for coarse step flaking on the convex tools; and this may be the result of battering or of resharpening of the edge.

Fig. 21b illustrates an oblate pebble with two flakes scars, showing flat bulbar surfaces, absence of cones, and lines of fracture radiating from diametrically opposed points of percussion, the result of anvil or "bi-polar" technique.

C. The Middle Soan A. Figs. 22, 23 and 24.

This cultural stage is found at the beginning of the second phase, m_2, of the Middle Pleistocene, coming from the highest depositional terrace surface of the Boulder Conglomerate and from the erosional slope E_1, but never, unless derived, from lower levels. The pieces are patinated brown or purplish brown and are unworn.

Some specimens are intermediate in patination and state of wear between the Lower Soan and the majority of this group, which is to be expected in an area under continuous occupation, as was apparently the case here. The artifacts described, fifty-one in number, are of an age undoubtedly later than Lower Soan. Here, as in the latter, numbers are insufficient to determine significant relative frequencies, but there are about equal numbers (one-fifth) of cores and Soan Type tools and the core-flake element as a whole is much the most numerous (four-fifths). The unilateral nucleate is the most common of the Soan Type tools constituting about a third of the total, the convex oblate being also common as in the Lower Soan.

The tools are still fairly large and heavy, the biggest weighing nearly ten pounds. Flat-base tools are more prominent than in the Lower Soan and the true boat-shaped artifact appears, Type 3. The terminal flat-base is more developed in having finer, fairly uniform preparation of the working edge which remains not quite regular in outline. The oblate pebble forms continue into this stage without development. The undulating edge of the nucleate is somewhat finer, since smaller flakes are struck in its preparation, and it is also more regular for the scars are more uniform in size. Such edges appear to be made intentionally and support the contention that these artifacts are tools rather than cores which they resemble. There are a number of simple nucleates with only little preparation. Concurrently a wider range of core forms is indicative of developing control of technique in flake

production. Since in both Middle Soan A and B several forms occur at the same stage of evolutionary development, the repetition of figures has been avoided and appropriate references made. *Figs. 22-28 should be regarded as illustrating one group, the Middle Soan.* Differentiation into A and B is necessary to illustrate the development of technique during phase m_2.

Soan Type Tools

Type 1. Terminal flat-base: Fig. 23b. From a natural, flat cleavage plane flakes have been struck off steeply towards the cortical upper surface, the flakes necessarily small since the thickness is not great. Even so, and despite the excellent striking platform provided by the flat surface, nearly half the working edge is made up of step flaking. This appears deliberate and not the result of utilisation, for the edge is not battered. The absence of the latter suggests a scraping or cutting operation.

Type 2 Unilateral flat-base: One example was found, similar to Fig. 25b of Middle Soan B; it is now in India.

Type 3 Bilateral flat-base: Figs. 22a and b. In Fig. 22a the pebble is split in the plane of the short axis perpendicular to the equatorial, and subsequent trimming from the flat base has produced a steep peripheral working edge around the base of a rough truncated cone. In this particular instance one side is more nearly straight than the other, and a good point has been produced at one end, accentuated by a notch which may be the result of utilisation. It would seem that this kind of strongly backed point or beak was one ultimate aim in the mind of the manufacturer, and the rest of the trimming was required to produce a good handhold. (Compare with Fig. 21d in the Lower Soan, where more than one point was produced). As will be seen later, in the Upper Pleistocene it is the point which undergoes development.

If the pebble is split in the plane of the long axis perpendicular to the equatorial, then trimmed in a bilateral fashion, the result is a "*boat-shaped*" artifact, Fig. 22b, a point or two points being automatically produced and requiring no trimming. At first sight this artifact closely resembles the core from which a cleaver has been struck but, of course, has no relationship, the hollow or flat base being prior to trimming

and not subsequent. The form is quite distinctive and appears in later industries, but it was not felt justifiable to give it a specific name outside the flat-base bilateral group.

Type 4 Convex oblate: These are closely similar to that figured for the Middle Soan B, Fig. 26b.

Type 5 Pointed oblate: One example is like that already described in the Lower Soan, Fig. 19c.

Type 6 Unilateral Nucleate: This is the most common tool in the Middle Soan and is illustrated in Fig. 28d for Middle Soan B.

Type 7 Peripheral nucleate: Absent.

Type 8 Turtle back: Absent.

Cores

One *pebble core* (as in Fig. 20c, Lower Soan), was found. Three-quarters of the cores are *proto·biconical*, ranging in size from fairly small, Fig. 23a, to large, Fig. 23c. These are typical stages in the normal development of the Lower Soan pebble core.

Spindle core: Fig. 24a. This is a typical example of the spindle form which has evolved from the proto-biconical through the use of an ovoid pebble. The technique in handling such a core is so advanced that, as already suggested, a more elementary form must have existed in the Lower Soan.

Proto-tortoise core: Fig. 24b is a simple, unfaceted, convergent form. The striking platforms of flakes from such cores must have shown at the most three facets, and a platform-angle of more than 90°, since the platform preparatory working is not at right angles as in truly faceted cores. Fig. 24e is a more advanced unfaceted, convergent core, and was probably used in the manufacture of individual flakes, that is to say, the convergent preparation was repeated for each single flake struck.

Though no examples were found, it is probable that a still more advanced type was used, with a tendency to *longitudinal* preparation, as indicated by the reverse surface of the flake Fig. 24c.

Flakes

Fig. 24c, with low-angled platform and simple faceting, shows two longitudinal preparatory scars and others convergent. It is a form

common in the early Levallois culture of Europe, wherein it was struck from a longitudinal tortoise core. Apart from this specimen the platforms, which are sometimes skew, are unfaceted or only simply faceted in accordance with the predominance of the proto-biconical cores. Similarly they tend to be thick with high-angled platforms, and the primary flaking is crude, Fig. 24d, cortex often remaining. About half show signs of utilisation, but some step flaking may be a form of retouch. The bulbs have sometimes been removed by striking off a single flake from the reverse side; and occasionally a flake has been removed from the same side at the end opposite the bulb.

Retouch

Rough step-flaking seems to be the only method of refining working edge outlines, and even this occurs only sparsely.

D. Middle Soan B. Figs. 25, 26, 27 and 28

This group is found in gravels of phase m_2 age and, contrasting with the Lower and Middle Soan A, it is unworn and either little patinated or quite fresh. It may be slightly patinated when found on the surface of the two uppermost terrace levels, the terrace of deposition of the Boulder Conglomerate and T_1. One group was excavated in fresh condition in re-sorted gravels on T_1 at Khushalgarh. A heavily worn specimen from gravels of third glacial age, and of erosion stage E_2 and beginning of phase u_1, is quoted as an example of a type missing in the collection of fresh material. Eighty-four pieces form a group and of these thirty-seven are Soan Type tools, thirteen are cores and seventeen are flakes, the Soan Type element being thus distinctly dominant.

Soan Type Tools

By far the most prominent tools are the convex oblate, Type 4 (of which there are eleven) and the closely related unilateral nucleate, Type 6 (ten examples). This repeats the relationship in the Lower Soan. The unilateral flat-base is represented by four pieces.

Type 1 Terminal flat-base: One example as in Fig. 23b from the Middle Soan A.

Type 2 Unilateral flat-base: Fig. 25b. In this stage of Soan development the unilateral flat-base reaches its typical form, large in size, with a strong, steep working edge built up with step flaking. In no case does the edge show battering as if used as a

chopper, but some tiny flake scars simulating step retouch appear to be the result of utilisation. Infrequently small chips have come away from the flat base. It is on these grounds that it is believed the operation was some kind of scraping action.

One flake, Fig. 28f, might well be classed with the unilateral flat-base type. The steep edge, produced by a mixture of free-flaking and step retouch, is similar to that of the typical unilateral flat-base with a straight or slightly convex working edge.

Type 3 Bilateral flat-base: Fig. 25c. There are two specimens, that figured being a good example of the Type in that the splitting is parallel to the longitudinal axis.

Again steep step flaking has produced strong working edges along two sides of the split pebble, keeled dorsally. The boat-shaped form, Fig. 22b, with free flaking all round, continues to be made—two pieces.

The form with splitting perpendicular to the longitudinal axis also appears, Fig. 25a, and trimming all round the periphery results in the production of a truncated cone. Here too a sharpened point seems to be deliberate (marked by arrow in the Figure), and is a development of the point in the earlier Middle Soan, Fig. 22a. It contrasts with the rounded end in the true bilateral flat-base, Fig. 25c, and it seems probable that they were put to different uses.

In the group of truncated cones must come the peculiar specimen Fig. 26c. The base is not a fracture but a cortical surface, and in this respect it is allied to the convex pebble tools. Apparently a very oblate pebble has been struck from one direction all round the equatorial plane, the working being steep and closely similar to that on the bilateral flat-base. This symmetrical working produces a trapezoidal cross-section. The strong working edges are not battered as if used for chopping, though some chipping may be the result of a scraping action. But parts of the edge are *smoothed* away, portions of the aretes between small adjacent scars being rounded off. This smoothing is not confined to any particular portion of the periphery and appears to extend on to the ventral surface which, to the finger, feels somewhat smoother than the dorsal. This may be

due to differential weathering of the two surfaces, but the edge smoothing suggests that the artifact is a rubbing or rasping tool.

Type 4 Convex oblate: This, the most common tool, is well represented by the figured specimen, Fig. 26b. A specialised form occurs twice, Fig. 26d. Viewed from either side this tool shows the same appearance, the convex edges being formed on opposing sides of the pebble and of the periphery, struck from diametrically opposite directions. On account of the low angle of working the result is a parallelogrammic cross-section. This idea of reversal of the tool is akin to the biface technique, but the form is entirely different to any in the biface cultures.

Type 5 Pointed oblate: One coarse example was found like that from the Lower Soan, Fig. 19c, and is now with the Indian Archaeological Survey. Attention is drawn, however, to Fig. 26a, described under Type 8.

Type 6 Unilateral nucleate: The coarse form is illustrated by Fig. 28d, a side view.

Type 7 Peripheral nucleate: Only two examples of this tool type were found, Fig. 28e, which in itself might well originally have been a core, later utilised as a tool. However, the coarseness of the work on the ventral surface shown does not compare well with the preparatory working of undoubted cores.

Type 8 The turtle-back: Fig. 26a. It is not certain whether this particular artifact should be placed in this category or under that of the pointed Type 5, as already mentioned. The ventral surface is entirely cortex and rounded, rather than flattened like the usual oblate pebbles used for Types 4 and 5. The dorsal surface is entirely worked over, unlike either of these types and like the true turtle-back of later times. Nearly one half is taken up with one large scar surface and the other half with scars of smaller trimming work designed to produce a rough point. Some wear, the effect of utilisation, is evident, not only on the point, but on other parts of the periphery, as on the true turtle-back.

Cores

The complex of *cores* is similar to that of the Middle Soan A, but there is definite development in two directions. Nearly half the cores

are proto-tortoise in form, that, is more emphasis was laid on the production of definitive forms of flakes. The ventral surface, in keeping with the above, is more carefully prepared. Nevertheless, the platform preparation (among other indications) leads us to assume that the Middle Soan does not develop into the Moustierian form of the Clactonian in the Upper Pleistocene, to be described later.

Pebble Core: One example, as in Fig. 20c.

Asymmetric biconical core: One example.

Proto-biconical core: Fig. 27a is the only specimen.

Spindle core: One only, similar to Fig. 24a in the Middle Soan A.

Proto-Tortoise core:

(a) Six are *simple, unfaceted, convergent*, Fig. 27c.

(b) Three are *simple, unfaceted, single* with convergent preparation, Fig. 27b. This is a well-worn artifact from the gravels of third glacial age and presumably belongs therefore to the Middle Soan. The other specimens, both of Panjal Trap, are now in India and in America. (*See* notes on flakes). The lack of faceting cannot have prevented the production of flakes of uniform thickness and shape.

Flakes

Seventeen flakes only were found, but these were enough to show correspondence with the core types represented. Fig. 28f is a large flake, struck at some earlier period as the worn surface shows, but re-touched in phase m_2 times. As already mentioned, it belongs in effect to Type 2.

Fig. 28g is a large quartzite flake with a low-angled, simply faceted platform, the reverse surface showing the remains of two scars and some cortex. It was probably produced by free flaking preparation of a large core, and implies the employment of considerable force, perhaps through the use of a stone hammer hafted to give the requisite power and "follow through"—note the hinge fracture, the cones of percussion, and the large bulb.

The flake, Fig. 28c, is of Panjal Trap. This material, finer grained than the quartzites generally used throughout earlier times, lends itself to finer working, ease in core preparation and hence uniformity in thickness. In the Upper Pleistocene the smaller tools are consistently made

of such rock, contrasting with the almost universal use of quartzite previously. The difference cannot explained in terms of regional distribution of rock, since the Panjal Trap is found on the Indus terraces as frequently as on the Soan; but it may lie in the size of tool employed, for the Trap does not form such large pebbles as the quartzite, and would be more suitable for the smaller and more developed tool forms.

Fig. 28a is also made of Panjal Trap. The preparation suggests removal from a convergent protortortoise core. The bulb and platform have been struck off by subsequent retouch or utilisation. Utilisation of the thicker platform edge of a flake is common in the European Clactonian, (sensu stricto), and is shown on flake, Fig. 28c.

Fig. 28b is a similar flake, with a simply faceted platform at an angle of 105° to the surface. It is somewhat thicker than the preceding two.

Platforms appear to be at lower angles than in earlier industries, as is to be expected with the development of the proto-tortoise core, but there is still no evidence of fine faceting and the true tortoise core technique. There is also no sign of the longitudinal core, which it is suggested, existed in the Middle Soan A.

Retouch

Retouch is still poor. The steep, step retouch of Fig. 28f is distinctive. Otherwise utilisation rather than retouch proper is more prominent on flakes. Forms of edge are straight, convex, notch and point.

CHAPTER VII

SOAN OF THE UPPER PLEISTOCENE

A. Upper Soan A. Figs. 29, 30, 31 and 32

The Upper Soan A occurs more frequently in our collections than any other group of the Soan culture. The sites are widely spread along the Soan River terraces and it would seem that at this time the whole basin must have been comparatively well populated, perhaps more densely than at any time previously, or even later, until the settlement of food-growing peoples. But it may be that the stratum (gravels of third glacial age), besides being protected from erosion to some extent by the superincumbent Loess, is very easily distinguished on the prominent terrace T_2, and the searcher is drawn towards it.

One site, that of Ghila Khan, has been selected as representative since the majority of types encountered elsewhere are here present, and it is also the most prolific of all the Upper Soan A stations. Moreover, because it is either a working floor or an open station of some kind, a truer picture of the industrial complex is obtained than if a survey were made of all the artifacts of this age, for isolated pieces would necessarily be included in the latter. Altogether some 380 artifacts of the Upper Soan A were found, and of these 120 come from Ghila Khan.

Of the artifacts considered in this description about one third are flakes, a third cores, and a third Soan Type tools. Three well-worn specimens are derived from Middle Soan times. Half of the rest are perfectly fresh, unworn and unpatinated, and the others are faintly worn and patinated. This slight wear is probably the result of river washing before the final passing away of the third glacial precipitational increase.

Since the number of flakes in the collection certainly does not equal the number struck either from cores or in the manufacture of pebble tools, it must be presumed that many have been removed, or else that the cores and pebble tools have been concentrated by transport from a working site. Be that as it may, in estimating the relative importance of pebble tools and flakes it is obviously wrong to compare the numbers of each for a large proportion of the flake element must have been produced

in the manufacture of pebble tools. If, however, the relative frequencies of cores and pebble tools are considered, a more satisfactory estimate is obtained, though still subject to question since more than one tool is made from a core. In which case it is useless to give detailed statements of percentage occurrences of flakes, cores, and pebble tools. But it is useful to give a general statement of the relative frequencies of the various types of Soan Type tools, and of the cores, and of the working edges of flakes. A further complexity, which will be noted more fully later, is the utilisation of cores as tools they most resemble. In such cases it is generally only the marks of use which differentiate the core-*cum*-tool from the core alone.

Soan Type Tools

Type 1 Terminal flat-bases: Fig. 29a. A small oblate pebble has been split along the major axis parallel to the equatorial plane. The almost completely flat bulb, and the shatter markings, are typical. One end has been trimmed steeply to give a roughly convex edge, divisible into two portions, one straight and the other made up of two small notches and intermediate nose. The trimming is so extensive that it approaches the unilateral flat-base, from which it can hardly be differentiated. Presumably the functions of these forms are here closely allied, or else one function requiring a specialised tool has ceased to be important.

Fig. 30a is a pebble broken along the short axis perpendicular to the equatorial plane, and it too bears typical shatter markings. At one end two longish flakes have been struck steeply upwards from the flat-base, as in a steep core. The concavities of the scars, and a small nose between them, have been used in scraping. There is wear on this nose on both the ventral and dorsal surfaces, which is not the result of normal scraper action. This form of edge may have been intended for a gouging-scraping operation, with the flat-base resting on the object treated.

Type 2 Unilateral flat-base: Fig. 30d. The pebble in this case has been split along the main axis but irregularly shattered, especially on one side. On the opposite side trimming with step flaking has rounded out a steep, unilateral convex working edge. The lower end in the figure is composed of one flake scar, from which flakes have been struck upwards in a way simulating Fig. 30a. This may have been its original form, from which

it was converted into the unilateral flat-base, or "side-scraper".

Type 3 Bilateral flat-base: Fig. 29d. Again a split pebble, this time with a more pronounced bulb, has two sides trimmed with free flaking, and finished off with some step retouch. These edges meet in a convex, or blunted, point. In this it approaches the form of a true point.

Continuation of trimming all round the periphery leads to the truncated cone, Fig. 29b, as in the Middle Soan B. But here the dorsal surface is not cortical, but part of an old cleavage surface and the section is trapezoidal. In this it resembles Fig. 26c of the Middle Soan B, though there is no sign of smoothing on the ventral surface or edges. Indeed on this latter surface, some secondary step working has led to a convex edge (top left of the figure), used either in scraping or cutting.

Type 4 Convex oblate: Fig. 29c is a direct survivor of the Middle Soan form, Fig. 26b. There are no signs either of battering or scraping wear; it was possibly a knife.

Type 5 Pointed oblate: There is no example of this type in the collection. It may well be that the point in Fig. 29d filled the need for this particular kind of working edge.

Type 6 Unilateral nucleate: This is the most common of the pebble tools, c.f. Fig. 28d. There are many of this type which are difficult to distinguish from the more advanced of the pebble cores, that is those having several flakes removed from either surface, producing a scalloped edge, c.f. Fig. 31c. On some there are signs of wear, occasionally on both sides of the edge, more often on one side only, rather the result to be expected from a scraping operation. The smallest is about one and three quarter inches in size.

Type 7 Peripheral nucleate: Fig. 30c. This too is fairly common and here attains its maximum frequency in the Soan culture. It closely resembles a biconical core, but the edges are secondarily retouched to give a more even and less scalloped line than in the latter. Such edges show small chipping from utilisation, and there is little but the retouch and this edge, chipping to distinguish the tool from the true biconical core. It is possible that this tool sometimes was a core to begin

with. Fig.30b is a small unfaceted convergent core, which has been reduced, the edges roughly retouched, and then used as a peripheral nucleate tool.

Type 8 The Turtle-back: There are no definite examples of this type, but the end product of reduced multi-convergent cores may be related, c.f. Fig. 31d.

Cores

The prominent feature is the appearance of the tortoise core.

Pebble core: Fig. 31c. One third of the combined total of Soan Type tools and cores is of this form of artifact. The more advanced, with several flakes removed and some wear, are similar to unilateral nucleates, (*see* above). One example, on an elongated pebble pointed at one end, foreshadows the pointed bifacial type of the Upper Soan B, Fig. 36a, and may reasonably be called a tool. Simple pebble cores, that is pebbles broken with a free blow leaving one deep flake and bulbar scar, have been used as concave "scraper edged" tools, and should be placed in the category convex oblate tools as a special form.

Asymmetrical core: One tenth of the cores are of this kind, most being pebble cores which were subsequently struck in heterogeneous fashion.

Biconical core: There are some peripheral nucleates, Fig. 30c, which have quite a large proportion of their edges scalloped and not retouched to form an even line. As already pointed out these can quite well have been, and some probably were, biconical cores. Certainly some of the simpler flake forms were struck from biconical cores, though none of those found were definitely retouched as tools.

Unfaceted tortoise core: Fig. 31b. Forming about one tenth of the cores, these are quite distinctive on account of their disc-like appearance, though they may be somewhat rectangular. They differ from the biconical cores, for whereas on the latter flakes are struck from both surfaces, on this type the ventral surface is trimmed for preparation of platforms only, and the desired flakes are removed solely from the dorsal surface. Thus, as more flakes are struck, the core is reduced in thickness until no more can be easily removed, and the end product is like that of Fig. 31d, resembling the turtle-back.

Single unfaceted tortoise core: Fig. 31a. One fifth of the cores fall into this category, some small like that figured and others twice as

large. The platform is generally of one scar, and from it is struck one flake, large in comparison with the core itself, the surface not being highly inclined to the platform. To produce a single flake of this type, a technique may have been used resembling that in the European Levallois culture, with pressure applied to the dorsal surface at the time of striking, but without platform faceting.

Double unfaceted tortoise core: Where the single core is large, the required flakes may be struck from plain platforms on opposing sides of the core resulting in the double unfaceted tortoise core (compare with Fig. 35d, double faceted tortoise core). There was one of this form in the group.

Flakes

The majority of the flakes, Fig. 32, have unprepared, cortical, high-angled platforms, probably derived from the preparation of cores and tools, though some have been utilised as tools themselves, cf. Fig. 33d. The others are quite distinctive as a group, of which Fig. 32 gives a good picture. There is no tendency to blade form, but rather towards a squat, sub-circular or sub-triangular shape, the shorter axis being as nearly as long as the broader. These are typically from the unfaceted tortoise cores, and in their shape are reminiscent of the European Levallois, but, of course, without the faceting of the latter. Some retouch of the platform from the reverse surface occasionally simulates the faceting, Figs. 32b and c. It will be observed that the platforms are generally small and nearly at right angles to the surface. Another feature achieved by this technique is the uniformity of thickness, even close to the edges, a uniformity excellent for scraping tools with steep retouch, but not for points. Flakes from disc-like cores yield the more triangular forms, Fig. 32f, and in this are approaching the Moustierian technique. They are less uniform in thickness, being heavier towards the platform and thinning away towards the farther end, as in true points.

Types of working edges are convex, end and side, Fig. 32e, small point with notch, Fig. 32d, and simple notch. As remarked above, there is sometimes retouch of the platform from the reverse surface.

Retouch

Retouch is not very common. The use of hard quartzite produces naturally sharp edges, and the uniform thickness of the majority of the flakes from simple tortoise cores leads to a strong edge without the need of trimming. There is little step flaking, much less than in the

Middle Soan because there is more accentuation here on the flake element. There is also greater use of free, stone trimming of edges, not well controlled and leaving somewhat broad retouch scars.

A small hammerstone was found on the site. It is three inches long, and about one and three quarters broad in the middle where it is waisted. The battering is confined almost wholly to both ends with but little on the sides. It thus appears to have been held nearly at right angles to the plane of the striking platform or the edge to be worked. Such a small stone held directly in the hand cannot have provided the weight and purchase necessary for striking flakes, though possibly it could have been used only for retouch. Even so, some difficulty would be encountered in keeping the battering to the ends. On these counts it is thought that it must have been hafted as a hammer, the waist forming an excellent hold for the shaft bound round it in the Australian fashion.

One long blade-like flake with clayey-loess still adhering to it was also found. It is believed that this is a stray flake washed out of the Potwar Loess when the latter was removed by sub-aerial denudation. The flake is a good parallel to the blade-like forms which are found in the Loess, cf. Fig. 42f.

B. Upper Soan B. Figs. 33, 34, 35 and 36.

A working floor was discovered by de Terra at site 18, Adiala, where nearly 600 artifacts were picked up over an area of less than 350 square yards. Some of the flakes seemed to be grouped together, as if undisturbed since the time when they were struck, and one asymmetrical core was surrounded by a few flakes which had been removed from it. This industry could be traced laterally passing below re-deposited Loess and into the gravel at its base, thus being interpreted as early phase u_2 in age.

The artifacts are fresh and unpatinated, a few being polished as if by desert conditions, probably having been exposed during the drier period of re-deposition of the Loess. The raw material is a Dhok Pathan conglomerate, providing rather small pebbles from which the tools were made. Hence no pieces were found comparable in size with those of the Middle Soan; on the whole, the earlier Upper Soan A, made from a heavier third glacial conglomerate, shows grosser characteristics as well. Despite the difference in size most of the regular Soan types occur, and the cores are much advanced. The increase of the core-flake element is more marked here than in the Upper Soan A.

Soan Type Tools

Type 1 Terminal flat-base: Fig. 33c. This is the most conspicuous form of this type of tool, there being eight specimens at least. The pebble has been broken along the shorter axis perpendicular to the main plane, and from this surface two or three flakes have been removed upwards towards the domed cortical top. This flaking may not only be at one end, but in some cases on one side as well, thus tending to simulate the unilateral type. In fact such a specimen cannot, theoretically, be distinguished from the unilateral flat-base, but since the pebbles are small this side trimming is not much greater in extent than that on the end. The trimming is simple since little is required to make a strong edge, and secondary work is negligible, being obscured by the wear of the edge during use. This may be quite considerable, forming a kind of facet (*see* figure) suggesting not a cutting operation but rather one of gouging-scraping.

In this industry it is also sometimes difficult to tell whether a core, which is similar in shape, may not have been utilised in this gouging-scraping fashion. Two examples are illustrated, Fig. 33f and Fig. 34b, and will be referred to in the section dealing with core types.

Type 2 Unilateral flat-base: There are no true examples of this type in the collection, but it has been noted that the terminal form may have some working along one side as well and so simulates the unilateral.

Type 3 Bilateral flat-base: Fig. 33b. The typical form is absent, but like Type 2 it occurs in the Upper Soan A and in the later Final Soan, and therefore one may assume that it is by chance only that it has not been found here. However, as in the Middle Soan and Upper Soan A, continuation of the working all round the periphery led to the truncated form, here figured, which, in the earlier industry, shows smoothing on the ventral surface. Here the smoothing is not apparent on this face, from which, indeed, two small flakes have been removed; perhaps it has been used as a core. The primary working is free flaking and the edges show chipping on both sides, suggesting a cutting function on rough material. It can hardly have been used for chopping or hammering on account of its small size and weight.

Type 4 Convex oblate: This, formerly a common type, is here missing. Its operation, believed to be that of cutting or scraping rather than chopping, may have been carried out by a flake tool.

Type 5 Pointed oblate: This too is missing, but the point as a working edge appears on several tools simulating Type 5, except that bifacial and not unifacial working is employed—contrast Fig. 36a, and remarks thereon below.

Type 6 Unilateral nucleate: One very rough piece may be placed in this category, but, as in the earlier Upper Soan, the pebble cores appear to have been utilised for the operation ascribed to this tool in former stages of development.

Type 7 Peripheral nucleate: This is also represented by one rough specimen, which is more like a biconical core.

Type 8 The turtle-back: Fig. 36b. The turtle-back is here typical for the first time. There is little or no trimming on the ventral surface, and the dorsal surface does not show that regularity of preparation which is characteristic of cores. The edges have in parts been secondarily worked to produce an even outline, absent on the true unfaceted convergent core, which it simulates, but present in the peripheral nucleate, a related tool. In Fig. 33a we have the intermediate form. This may have been originally a disc-like convergent core, which has been reduced until useless for the manufacture of flake tools, whereupon it has been turned into a tool by secondary working around the edges, all signs of platform preparation being thus removed. The point and broad convex edge of the true turtle-back are absent, and are replaced by two notches with intervening point, (in the lower right corner of the figure), and an S-twist edge, the result of retouch from opposing directions (marked by arrows in the central figure).

It was noted above that the true Type 5 is not present, but that the point is provided by bifacially worked tools, here shown in Fig. 36a and c. Fig. 36a is not far removed from the typical form of earlier times, and it can be readily appreciated that with developing familiarity with core bifacial working a point such as this is a natural successor. The larger specimen Fig. 36c cannot be regarded in the same light. It is by far the largest tool in this industry and in some ways resembles a rough convergent core, since part of one side

remains cortical. It cannot be a developed form of Fig. 36a since the working is extended over the whole of one surface but in this respect it approaches the true turtle-back, Fig. 36b, and in the latter a point, now broken off, was also a feature. It has already been surmised that the turtle-back was perhaps a derivative of the convergent core, Fig. 31d, but in Fig. 36c the point is a form towards the making of which the working was definitely directed. The true turtle-back continues into the post-Pleistocene as a non-pointed tool, therefore we must consider Fig. 36c as an aberrant tool. In this light the possibility must be considered of contact with a Stellenbosch culture which was contemporaneously present in these parts. It is by no means unlikely that in these bifacially worked tools, and in particular Fig. 36c, we have the fruits of that contact, the perception by the Soan people of the Acheulian pointed tool and the endeavour to translate that into being with the technique at their command, the bifacial working of cores.

Cores

The complex of cores is distinctive from that of the Upper Soan A, not in form, but in smaller size and the development of fine faceting.

Pebble core: Fig. 34a is typical of a series of such cores, with flake scars ranging from one up to nine. The single flake cores have been utilised as concave "scraper edged" tools, as they were in the Upper Soan A. The more complicated forms have sometimes been used as unilateral nucleates, from which they can hardly be distinguished.

Asymmetrical core: There are no examples of this type; it may be that owing to the small size of the pebbles and the need for utilising the biggest pieces as economically as possible, the asymmetrical core was not employed, being wasteful.

Biconical core: There are several like those of the Upper Soan A, Fig. 30c, and, as in that stage, when utilised they cannot readily be differentiated from peripheral nucleates.

Single unfaceted tortoise core: Fig. 31a of the earlier Upper Soan also occurs at this stage.

Single faceted tortoise core: Fig. 34c. This is the successor to the unfaceted form. The platform used for the removal of the latest flake is simple, but on another face the faceting is distinctive.

Double unfaceted tortoise core: Fig. 34d and e are the most elementary forms of this type. The striking platform drawn is of the simplest, and that from which the flake was struck in the opposite direction is cortical. Such a core when reduced might well have been used as a single unfaceted tortoise core as in Fig. 34c.

Double faceted tortoise core: Fig. 35d. Fine faceting of the opposing platforms of the unfaceted type, Fig. 34d, gives rise to this beautiful and economical core. It can be seen from the drawing that the flakes from this core would be thin and uniform in thickness, and that a large number, comparatively speaking, could be struck. The platform is low-angled. This particular piece is one of those which suffered some desert burnishing.

Disc core—faceted multi-convergent: Fig. 34f. This is the true disc core of the Moustierian culture. Good faceted platforms are prepared all round the periphery. and triangular and pointed flakes are struck convergently. In its own fashion this core rivals Fig. 35d for economy. Undoubtedly these cores were larger to begin with, as is shown by the flakes struck from them, but only the discarded, reduced portions have been found.

Steep core: Fig. 34b. From a small ventral platform composed of one flake scar, small blade-like flakes have been struck upwards along the side of the pebble. (This is the type of core from which evolved the European Upper Palaeolithic form). This particular core may have been used as a tool, for the beak-like nose (central part of the figure), is worn, and in this respect it resembles Fig. 33c, a terminal flat-base tool, the nose itself being reminiscent of the point on the bilateral flat-base tool of the Middle Soan, for example Fig. 25c.

Fig. 33f is somewhat similar but, from the end opposite to the striking platform, secondary step flaking has cut deeply into the primary surface, thus sharpening the edge. This edge, and also the periphery of the striking platform, have been worn through use, the chipping showing pressure from one direction.

Flakes

There are 233 flakes, of which 58 have unprepared platforms of cortex, at a high or fairly high angle and with flattish bulbs. The rest can be subdidived as in Table 2, which shows, in the case of faceted flakes, the great increase in the proportion of low-angled platforms.

TABLE 2

Proportions of types of flake in the Upper Soan B

(1) Unfaceted		
(a) *High-angled platforms*		Nos.
	(i) Convex bulbs	28
	(ii) Flattish bulbs	58
(b) *Low-angled platforms* ..		
	(i) Convex bulbs	20
	(ii) Flattish bulbs	26
(2) Faceted		
(a) *High-angled platforms*		1
(b) *Low-angled platforms*		
	(i) Convex bulbs	17
	(ii) Flattish bulbs	25

This differentiation is qualitative and is therefore of little value statistically, but the figures give a general impression of the types. Again speaking qualitatively, and with reservations in view of the variations of flake types produced in the preparation of cores, a rough list of flake forms can be set out as below:—

TABLE 3

Proportions of Flakes from the various Core Types in the Upper Soan B

(a)	Preparatory flakes, group 1(a)i, ... (including the aforementioned 58 with cortical platforms)	ca 2/5
(b)	From biconical and unfaceted tortoise cores, group 1(a)ii	ca ¼
(c)	From single and double unfaceted tortoise cores, groups 1 (b) i and ii	ca 1/5
(d)	From single and double faceted tortoise cores, group 2 (b) ii	ca 1/10
(e)	From true disc cores, group 2 (b) i, ...less than	1/10

These figures are roughly approximately the same as the relative proportions of the cores found on the site, but one would have expected

many more of the simpler, unfaceted, high-angled flakes because of the amount of preparation required to set up a good tortoise core, and also on account of the number of pebble cores. It may be that the latter were trimmed roughly on the outcrop of the conglomerate a little distance away from the actual camping site, and were then brought there to be further worked up. The comparatively high percentage of faceted flakes is the result of the efficiency of the disc and double tortoise cores in economy of material, pointed out in the descriptive part.

The number of flakes which have been definitely retouched to form tools is comparatively very small. The majority are flakes with cortex, Fig. 33d and e, most likely coming from pebble cores. The platforms are sometimes removed by retouch, as is frequently the case with other flake tools. Fig. 33d has a skew bulb (*see* arrow) and opposite it a rough convex edge showing unidirectional "scraper" wear. The smaller example shows similar retouch or utilisation.

Almost half of the flakes come from unfaceted cores of the forms common in the Upper Soan A and the impression is one of distinct relationship; there is a predominance of sub-circular and sub-triangular shapes. Fig. 35f is a good example, triangular with the platform slightly skew, and the point retouched steeply, to sharpen it perhaps. On the other hand this retouched portion may be the operational edge in itself. Fig. 35a is a faceted flake related in shape, and was probably struck from a large disc core, before the latter had developed its normal form from which the triangular flakes were struck.

Flakes from disc cores are shown in Fig. 35b and e. Fig. 35e is typical, small and triangular, with the faceted platform slightly retouched, and with the point accentuated by retouch. Fig. 35b shows a flake surface, and illustrates retouch of the platform from the reverse to make a small pointed edge; and also retouch of one side from opposing directions to produce an S-twist.

Fig. 35c has been struck from a single faceted tortoise core, and shows the typical wide platform rather like the "chapeau de gendarme" of some Moustierian flake points. It has been retouched all round from the ventral surface, the point especially being nearly completely removed and replaced by a rounded nose. Fig. 35g was struck from a double tortoise core, as shown by the remains of a scar running in the opposite direction to that from which the flake itself was struck (arrow). The platform is simply faceted and not retouched; there has been some slight wear on the edges and the point has been broken off. There are few flakes of this kind.

Retouch

Retouch is not widely developed, that on Fig. 35c showing the extensive application of the normal, simple, undifferentiated edge working. Step retouch is rare. Working edges are convex, nose and point, notches and double notches with point, and the S-twist.

CHAPTER VIII

SOAN OF THE FINAL PLEISTOCENE

The Final Soan Figs. 37, 38, 39 and 40

The Final Soan is known from two sites, Dhok Pathan, No. 7, and Pindigheb, No. 8. The Pindigheb industry was first discovered in 1930 by K.R.U. Todd who very kindly gave it to the University Museum of Archaeology and Ethnology, Cambridge, placing it at our disposal for study. The site was visited by the expedition. The Dhok Pathan industry comes from the same district, and is remarkably similar to the Pindigheb. It may even be that the camp was made by the same people.

The artifacts are made of conglomeratic pebbles of Dhok Pathan age, chiefly of quartzite and Panjal Trap. There are some artifacts made of clear crystalline quartz but these are few in number. It was previously thought* that the Pindigheb industry could be divided into an early and late series on account of the sandy-coloured patination of some of the tools, but on separating out the latter it was found that they were entirely of Trap rock which weathers much more readily than the harder, darker coloured quartzite. On these grounds we concluded it was not possible to make any such subdivision.

The two industries show the same types of Soan tools, cores and flakes. These differ only in the relative frequencies. There are, for instance, about equal numbers of cores and Soan Type tools in the Pindigheb group, whereas there are two fifths Soan Type tools and three fifths cores at Dhok Pathan. The relative proportions of tool and core types are given below:—

	Cores			**Soan Types**							
	Disc,	Asym metric	Pebble.	1	2	3	4	5	6	7	8
Pindigheb	35%	30%	35%	20%	5%	40%	nil	16%	20%	nil	nil
Dhok Pathan	25%	50%	25%	25%	25%	25%	nil	15%	10%	nil	nil

*Hawkes C., and de Terra H., Palaeolithic Human Industries in the north west Punjab, Connecticut Acad. Arts and Sci. Mem., Vol. 8, 1934.

Roughly the same proportion of flakes show remains of cortex; there are more flakes in the Pindigheb industry. Accordingly, for purposes of description, these two groups are hereunder described as one, consisting of 343 artifacts of which half are cores and Soan Type tools.

Soan Type Tools

Type 1 Terminal flat-base: Fig. 37a and f. The first is typical. An elongated pebble has been split in the equatorial plane along a major axis, and one end trimmed steeply with free percussion flaking, giving a rough, slightly convex edge, two larger scars acting as notches. In Fig. 37f we see a form approaching the pebble core. A more spheroidal pebble has been split, from the flat-base three major flakes have been removed, and then some smaller trimming flakes to blunt one intermediate point. Here too the edge is composed of a series of notches.

Type 2 Unilateral flat-base: Fig. 37e. An elongated pebble has been split in the same manner as Fig. 37a, then worked along one side and a part of each end with free percussion flaking, followed by some fine retouch. The edge is again steep and irregular in outline.

Type 3 Bilateral flat-base: This is the most common type in the Pindigheb industry, two specimens being illustrated in Fig. 38b and c. The typical tool is shown in Fig. 37c from Dhok Pathan, a split elongated pebble worked along both sides and one end to give a flat trapezoidal section. The same free flaking trimming technique is employed as in the first two Types, and again the edge is irregular in outline. The end is retouched to form a kind of nose working edge.

In Fig. 37d and Fig. 38b the pebbles selected are more spheroidal and split across the main axis. From this flat-base flakes have been struck, as in a steep core, along two sides and one end. Further working at the end has produced a pointed nose strongly backed and rising sharply to the domed keel.

In the first piece the two sides of the nose are step retouched, still further emphasising this striking working edge form. There are no signs of utilisation chipping on the flat base around the nose, and it is presumed that the tool was used

in a gouging-scraping operation with the base pressed to the worked material, or as a kind of gouging instrument for scraping out wooden vessels as the Australian aborigines hollow out their wooden bowls and shields. We have considered the possibility that this tool is a "fabricator", but rejected it because of the poor leverage.

Fig. 38c is the form of bilateral flat-base where a spheroidal pebble has been split in a plane parallel to the minor axis, then trimmed all round the periphery, to give a truncated cone. On this particular specimen some step retouch at two ends has produced a considerable "overhang" like that in Fig. 37d, but the nose edge is not so well-marked.

There are no signs of smoothing on the flat-base, but some utilisation chipping from the edge towards the keel.

Type 4 Convex oblate: So common in earlier phases of the Soan, it is here absent.

Type 5 Pointed oblate: Fig. 38d. This example perpetuates the earliest form encountered in the Lower Soan, in that there is a kind of flat-base from which the trimming has been directed. This base is part of a flake scar rather than a flat cleavage surface. The great majority of the pointed tools are worked bifacially with the technique introduced during the Upper Soan B stage in the previous intra-glacial phase, (*see* Fig. 36). Of these tools Fig. 37b is a good example. The bifacial working is well directed to form a point with the minimum of trimming, leaving a considerable portion of the cortex on the butt end of the tool, probably as a hand-hold. The technique is consistent in its plan. An ovoid pebble is selected and, from the periphery of the equatorial plane towards both sides of one end and on one face of the pebble, one or may be two flakes are removed, these leaving deep scars on account of the shape of the pebble. From these scars and towards the other face, flakes are then struck, thus resulting in two sinuous edges meeting in a point. A few chips from the more projecting of the aretes, to give a smoother line, completes the tool. There does not seem to be alternation of working from side to side as in the normal Acheulian bifacial technique, but rather two stages of unifacial trimming, first on one side and then on the other. The points sometimes show chipping wear.

Type 6 Unilateral nucleate: Figs. 38a and e are fairly typical. The second shows the straighter, utilised working edge, and the first the pebble core form which may be a tool.

Types 7 *and* 8 Peripheral nucleate and turtle-back: These, though prominent in the Upper Soan, (the turtle-back reaching its typical form in the late Upper Soan), are absent.

Cores

Pebble cores are difficult to distinguish from the unilateral nucleates, as in all the Soan stages. Fig. 38a is an example already mentioned. But a great number are quite definitely cores, such as Fig. 37g, where one side is used as a striking platform for flakes taken from the other side. This technique is complementary to the tortoise core method.

Asymmetric cores are very common in the Dhok Pathan industry. The use of this core form, which has many variations, is very wasteful, but as in this case the source of the raw material was close by and prolific, there was no need to utilise every large pebble to its fullest extent. Probably most of the flake tools with cortex were prepared from these cores, some of which were undoubtedly intended for more advanced types but "went wrong" in the making. Fig. 39a shows this pebble core form with faceting of the platform side.

Disc cores are the only advanced forms present, and are typical, Fig. 39b and Fig. 40i. But on these reduced pieces there is a distinct lack of faceting, of the kind shown in Fig. 39a, and so striking in the Upper Soan. Nevertheless some cores were finely faceted, as the flakes show. One must suppose that the flakes generally desired did not have to be uniformly thin nor conform to a definite triangular point or subtriangular shape.

Flakes

In these industries (especially the Dhok Pathan) more than in any other can be observed a tendency for the edge forms, and the method of making them on large flakes, to simulate those of the flat-base. It may be argued that since the forms of working edges on stone are very limited there must be similarity, and this is indeed true; but where flakes are thick and massive (or comparatively so) they are likely to be treated in trimming and retouch as flat-base tools rather than large flake tools. Here, on account of the raw material, the flat-base tools are not much greater in size than the larger flakes, hence a convergence in treatment.

Whereas by contrast the small flakes made from disc cores (which are far more developed than the asymmetric cores from which the massive flakes were struck) are treated in a different fashion. Hence the asymmetric core-*cum*-flake forms a complex with the Soan Type element distinct from that of the disc core-*cum*-flake, a circumstance the significance of which will be discussed later.

Fig. 39 illustrates some of these massive flakes. Fig. 39d is a unilateral "flat-base", a thick flake with steep step retouch along one side. (It is the natural successor of the massive "side-scraper", Fig. 28f of the Middle Soan B). Fig. 39f is the bilateral "flat-base" with the trimming carried round the greater part of the periphery to produce a trapezoidal section. The similarity is strengthened in that the retouch forms a steep nosed point analogous to the gouging edge of the typical flat-base tools. Fig. 39e is the parallel of the pointed Type 5 and Fig. 40b of Type 1, the terminal flat-base.

The small flakes from the disc cores are quite distinct viewed as a group, Figs. 40c, d, e, f and g. They are small and sub-triangular in shape with comparatively large platforms. They are not so uniform in shape and thickness as flakes from disc cores in the typical Moustierian culture of Europe. Some show multiple preparation, Fig. 40e, to give uniformity of thickness, but the great majority are not so fine. There are gradations through examples like Fig. 40f to the simplest, as Figs. 40c and d. In these two last we see the difference between striking opposite a scar and between scars. Fig. 40d slightly trimmed, would produce a sharp-edged point with medial strengthening, whereas Fig. 40c is close to the Moustierian concavo-convex, wide-platform type of point. Nevertheless among 169 flakes not one was found retouched to the triangular pointed shape which one might have expected from such a good technique in core manipulation.

The concavo-convex flake with cortical platform, Fig. 40h, has been worn on the concave side of the platform and on the convex edge away from the striking point. It may have been struck from a pebble core. Fig. 40g is probably a by-product of core preparation, though it is rather like a biface flake. Fig. 40a is interesting in showing three flake surfaces, one from which the platform was made.

CHAPTER IX

THE CLACTONIAN INTRUSION

A. Upper Clacton (Punjab) A. Figs. 41 and 42.

A thin gravelly layer of small pebbles mixed with water-laid Loess and some clays of like structure is usually, though not always, found at the base of the Potwar Loess. The gravel cannot be separated from the Loess since, in places, the latter permeates the gravel entirely and rests on the subjacent third glacial gravels or other earlier rocks. The calcareous content of the Loess is also a feature of the gravel in which pebbles are often encrusted with a hard, pale-brown, concretionary matter. Where there seems to have been an abundance of calcareous infiltration the gravel may even be cemented hard, and in this it contrasts with the loose, non-encrusted gravel below. It is believed that this basal gravel represents the transition from the wetter conditions of the waning third glacial time to the dry and seasonally torrential conditions of the Loess stage.

At four sites artifacts were found in the basal gravel, crusted over like the pebbles and in two states of wear. The earlier, derived from the Upper Soan A of the top of the third glacial gravels, is worn, while the contemporaneous group is perfectly fresh and unpatinated. Altogether just under 100 specimens of the latter were found, of which between 35 per cent and 40 per cent are cores (or cores simulating pebble tools). The rest are flakes and form a grouping which is quite distinct from the preceding Upper Soan A. It is this distinction, and the absence of the typical Soan Type tool assemblage, which leads us to suggest that here is a new industrial tradition of intrusive character during phase u_1.

There is *one peripheral nucleate pebble tool* with much step flaking around most of the equatorial plane. Apart from this the only other specimens are *two unilateral nucleates*, Fig. 41e, which show no signs of utilisation nor of retouch; they may be *pebble cores*. The only other true pebble core is not symmetrically struck like the piece figured, there being one side apparently used more as a striking platform than for flake production—the convergent core idea.

Of the undoubted cores 10 per cent are *biconical**, about 10 per cent are *pebble* cores of the usual form, and 10 per cent *spindle* cores. There is a similar proportion of the *double, faceted, tortoise core* type, (cf. Fig. 35d), and 30 per cent are reduced, *unfaceted, tortoise cores* of which Fig. 41d is a typical specimen. A peculiar form related to this is Fig. 41a. Both dorsal and ventral surfaces show convergent preparation, but the flakes are struck from these respective surfaces in directions perpendicular to each other.

The rest of the cores, some thirty per cent, are typical Moustierian-like *disc* cores. Fig. 41c shows such a one, beautifully fresh and sharp, from which some flakes have already been struck and then new platforms faceted prior to further flake production.

Flakes Fig. 42

The flake assemblage reflects the preponderance of the faceted cores and convergent preparation, half showing platform preparation. There is a strong tendency to the triangular outline with broad platform at the base, Figs. 42a, c and d, being typical. These were struck from faceted double tortoise cores, (Fig. 42a especially being of this kind), and also from the larger disc cores, Fig. 42d. The flake Fig. 42b, (arrow marking bulb), probably comes from the peculiar core form Fig. 41a, though it may, indeed, have come from a double tortoise core so reduced that flakes were struck from a platform perpendicular to the one prior.

The two flakes, Figs. 42f and h, were probably struck from large double tortoise cores (cf. Fig. 43g), striking along the arete to give the median ridge effect, and with it the blade-like form. Fig. 42g shows more convergent preparation on a large core, possibly of the disc type, and has been struck opposite a bulbar scar, thus forming a more triangular flake with a wider platform, typical of the Moustierian point and occurring in the Levallois III, IV and VI of the Somme sequence.

These pointed flakes were most likely tools, either blades of knives, or hafted points to spears or javelins, requiring little retouch on account of their shape and the sharpness of the thin, hard quartzite edge. Some do show retouch, or utilisation, in the form of notched edges, as in Figs. 42c, d and h, on the right edge two thirds of the way towards the point, the retouch being from the reverse to the flake surface. The

**See* de Terra and Paterson, 1939, Pl. XXXI D.

significance of this is not quite clear but there is implication of scraper-notch function.

There are few preparatory flakes; perhaps the cores were brought from the source of raw material. This was most likely the second glacial Boulder Conglomerate, since this alone would supply pebbles large enough for cores from which to make such big flakes. Fig. 42e is a small preparatory flake which has been used as a tool, a small notch on the left of the point being worked from the flake surface.

Retouch

Retouch appears to have been confined mostly to the working of these small notches and to the strengthening of a point into a steep convex edge, as in Fig. 42f. No retouch of the striking platform from the reverse was observed, nor any step retouch which is so common in the European Moustierian.

In the absence of bouchers and Soan Type tools this industry can belong only to the "flake" family of cultures. Its geological horizon gives it the designation "Upper". The many references in the description to the Moustierian of Europe and the Near East suggest that this industry is of the Moustierian tradition within the Clactonian but, since no certain connections with the Moustierian have been found, we hesitate to go so far as to call it that. We prefer to leave this matter for discussion, and to apply the varietal name "Punjab"—hence Upper Clacton (Punjab).

B. Upper Clacton (Punjab), B. Fig. 43.

In the Potwar Loess itself, and a few feet above the basal gravel, therefore of no great difference in age to the Upper Clacton A, nearly 60 flakes and cores were found at two sites. No artifacts were found in the Loess above this level, and in view of their fairly frequent occurrence in earlier levels, and the climatic conditions under which this Loess was accumulated, it is considered that this region was not populated during the main period of Loess formation.

The artifacts are limited in their range, consisting of developed cores and their flakes. One worn flake is coloured purple, like the artifacts of the Lower Soan, is without a bulb, and on either side has notches struck from opposite directions, as if it had been twisted in the hand during retouch. The rest of the artifacts are perfectly fresh, sharp and unpatinated, and none has the concretionary crust of the basal gravel tools.

There are no pebble cores. There are a small, reduced *disc core*, Fig. 43c, a *double faceted tortoise core*, Fig. 43g, and a small, reduced, *unfaceted tortoise core*. There is also a *spindle core*, pointed towards one end and similar to a boucher in appearance.

The *flakes* derived from these core types are almost all triangular or blade-like in shape, and in general tend to be uniformly thinner than those of the basal gravel. They must have made excellent material for points. Fig. 43f had a retouched point now broken off, and the point of Fig. 43d has also been removed. Figs. 43a, f and h have been retouched on the platform from the reverse surface, a feature which appeared to be absent in the basal gravel group. Fig. 43f is also notched on the right side from the reverse like the three noted in the earlier Clacton.

About a third of the flakes seem to be preparatory, and again it seems that the cores were first worked up on the raw material site before being transported to the camp. Only one of these flakes is not utilised; some are retouched with notches and convex edges while one has the bulb removed. All these flakes and the points show signs of wear on parts of the edges. There is no step retouch, but secondary working is better than in the basal gravel series, for instance on Figs. 43a and h.

These two groups are contemporaneous in geological time. The minor technical development found in the later group corresponds with the slight lapse of time represented by the difference in the stratigraphical horizon. The complex of cores and flakes is closely similar to that of the European Moustierian of roughly the same age*. The most striking aspect is the virtual absence of the Soan element. Yet this element is present in considerable quantity in both the Upper Soan A and the Upper Soan B, preceding and succeeding the Loess in time. This sudden disappearance of the Soan and the equally sudden appearance of disc cores and finely faceted tortoise cores, with their accompanying triangular, point-like and long blade-like flakes, can only mean the intrusion into or invasion of the region by an extraneous culture complex. Its disappearance and replacement by an industrial assemblage, the Upper Soan B, in which the Soan element is again prominent, and in which the flake and core forms are essentially the direct survivors of the Upper Soan A, (with some adopted features of the Clactonian, such as the disc core and fine faceting), implies that

*As defined in a previous paper "Core, Culture and Complex", Proc. Prehist. Soc., 1945.

the Clactonian people had withdrawn, or been wiped out by the time of return of the Soan people who, during the dry Loess period, had migrated elsewhere. The Clactonian here is therefore an intrusive culture and not an invading culture.

C. Upper Achelian Clacton (Punjab) Figs. 44 and 45

At Chak Sighu, near Chauntra, Site 14, from slope-washed, redeposited Potwar Loess of phase u_2 age comes a small assemblage of fresh, unworn artifacts, bouchers, cores and flakes.

Cores

There are four cores, all developed forms. Fig. 44e is a flat tortoise core, not quite disc in form, with faceted platforms; there are two of these. Fig. 44f is a small, reduced disc core with fine platform preparation. It appears to have been utilised. The fourth core is of the same form but the cortical base is keeled and the platform preparatory scars run towards the apex, giving the appearance of a small, steep, blade core.

Flakes

Three flakes, Figs. 44, a, b, and c, are all struck from advanced cores with faceted platforms and multi-convergent preparation. Only one flake showed a sub-triangular form which might have arisen from disc core technique. There are a few small flakes like Fig. 44d which have been either retouched or utilised.

Retouch is infrequent; there is one small convex edge. But there are signs of utilisation, small notches and indiscriminate chipping.

Bouchers

There are two *pyriform* bouchers, Fig. 45d, finely regular in outline and edge, and symmetrically biconvex in section. The secondary working is beautifully controlled, reduced to a minimum with maximum effect—showing excellent technique.

Of three *cordate* forms, Fig. 45c is made on a flat-base, the others being normally bifacial and symmetrical in section.

There is one *pointed ovate*, Fig. 45e, also made on a flat-based pebble, and showing fine tertiary working of the edges to produce a regular outline.

One *ovo-pyriform* has the butt practically untrimmed, and the working end thin and blade-like, a kind of cleaver edge.

Two flakes, Figs. 44a and b, may be regarded as pointed tools of the boucher form reduced by utilisation and re-working.

Though this assemblage can hardly be called an industry it has most of the elements by which an industry can be identified. In this case it is difficult to say whether the boucher or the core-flake element is dominant, but numerically the core-flake is stronger. There are neither Soan Type tools nor cleavers. Hence this assemblage, from phase u_2 of the Upper Pleistocene, can be called Upper Acheulian Clacton with the varietal name (Punjab) to distinguish it.

There is, however, a familiar "feel" about this group of artifacts. It is akin to the Upper Moustierian of Europe, in which contact with Acheulian culture is shown in the presence of the typical cordate "coup-de-poing". There are also resemblances to the Fauresmith of Africa in this mixture of disc core and fine boucher. Indeed the two stages Upper Clacton (Punjab) and Upper Acheulian Clacton (Punjab) have strong resemblances to the lower and upper stages of the Moustierian succession of Europe and the Near East. Again we hesitate to apply the name Moustierian until more evidence of connection is produced.

There is a striking point to which longer reference will be made later. It is that this Moustierian-like series appears in the Punjab at two periods when the climate became dry and loessic, and when the Soan people appear to have migrated elsewhere.

CHAPTER X

THE STELLENBOSCH INVASION

Also at site 14, Chak Sighu, another interesting group of artifacts was discovered. From the basal cemented gravel below the redeposited Loess, beginning of phase u_2, come two groups of bouchers accompanied by cleavers, cores and flakes but no Soan Type artifacts. The earlier group is heavily worn and the later faintly worn*. The exact relationships and age of the deposits there found are discussed in the chapter on stratigraphy of sites.

A. Middle Stellenbosch. Fig. 46

It is remarkable that worn bouchers and cleavers have been found at only two other sites in the Indus and Soan basins, at Gariala near Campbellpore, site 1, and at Balawal, site 10. The Balawal specimen was found in a gravel corresponding to the cemented gravel of Chak Sighu. The Gariala piece, a cleaver, was discovered on the surface of Terrace T_2, and, if one assumes it is of the same age as the terrace materials which are of phase u_1, it is probably late Middle Pleistocene in date. This suggests very sporadic entry into this region by boucher-making people at a period earlier than phase u_2. That several very worn pieces should be found at Chak Sighu with a concentration of later types can be attributed to rolling during the formation of the basal cemented gravel. Nevertheless these worn pieces are all much earlier, typologically speaking, than the faintly worn, therefore we are led to presume that we are dealing with the relics of a much older occupation occurring by happy chance in the same place as the later. It is true, of course, that peoples practising a similar method of food-getting will tend to find the same most profitable camping sites.

This heavily worn group is illustrated in Fig. 46. The coarse and incomplete flaking of Fig. 46a, and its keeled triangular section, are typical of the earlier stages in the East African Stellenbosch. The cleaver, Fig. 46c, would not be out of place in a Middle Stellenbosch

*From the redeposited Potwar Loess above, comes the fresh and unworn Upper Acheulian Clacton (Punjab)—previous chapter.

milien, with its rough primary working and the vaguely parallelogramic cross section. The foliate boucher. Fig. 46b, would accompany it. As an assemblage this group could be tentatively called Middle Stellenbosch.

The faintly worn group, of which there are nearly 100 pieces, is made up of bouchers and cleavers, both of a variety of types and much more finely made than the heavily worn. They show thinner sections and "wood" technique used in trimming for the production of regular outlines and edges, Fig. 47. The cleavers show a variety of symmetrical cross sections and are well finished. There are no Soan Type tools, but proto-tortoise, asymmetrical and biconical cores occur. The assemblage is typical of *Upper Stellenbosch*.

At Morgah, site 19, Dr. E. B. Pinfold discovered a site on cemented conglomerate of the same age. The biface element is identical with the faintly worn series at Chak Sighu, and the core-flake element contains the same types but is more extensive. The difference lies in the presence of Soan Type tools, which are, however, in a subordinate position. We must therefore conclude that at Chak Sighu the industry is pure Upper Stellenbosch without contact with Soan elements; and that at Morgah the industry shows contact with the Soan and must therefore be regarded as *Upper Soan Stellenbosch*, the Stellenbosch being dominant.

Since the biface elements of the Upper Stellenbosch and the Upper Soan Stellenbosch are identical it would be useless illustrating both groups and repeating the same descriptions. The bifaces are illustrated in Figs. 47, 48, 49 and 50. The common core and flake elements are illustrated in Figs. 51 and 52.

B. Upper Stellenbosch (Punjab)

Bouchers

These vary in size from nearly nine inches in length to below three. The primary flaking is free and bold, (probably stone percussion technique), and is followed up, in the finer examples, by either coarse wood technique with little sign of finer tertiary retouch, *e.g.* Figs. 47d and Fig. 48d, or by strong secondary step trimming, *e.g.* Figs. 48a and Fig. 49c, which gives a fine outline but not a thin section. The outlines are generally symmetrical, the forms being quite distinctive, and the edges are straight. About half of the pieces retain some cortex, but this does not detract from the fine character of the specimens. The lack of retouch, except in those cases where the secondary step working may be so regarded, may be due to the nature of the material, which is

a fairly rough quartzite brought from the Boulder Conglomerate and not immediately available at either Morgah or Chak Sighu. There is in particular a pale creamy quartzite, of which Fig. 48d and Fig. 49c are made, which fractures rather badly on account of incipient cracks, perhaps the result of fluviatile battering. Even so it is illustrative of the good technique that quite fine sections can be obtained.

There are seven main forms (82%), the rest indeterminate:-

Ovate. Fig. 49c 8%

This particular specimen is made on a flat-base from which all the working is directed, the section being trapezoidal. It could be regarded as the developed form of the bilateral flat-base. The rest are typical bifaces.

Pointed ovate 4%

These are much like the ovates, but slightly pointed.

Foliate. Fig. 48d 16%

These foliates attain quite thin sections, the most developed in this direction of all the bouchers. There are signs of utilisation all round the edges.

Ovopyriform. Fig. 47b and c 22%

This is the most common form and generally has some cortex around the butt end, as in Fig. 47b. The most advanced are almost as flat as the foliates, with symmetrical lenticular cross sections and straight and regular edges. The point appears to be the sole working edge.

Pyriform. Fig. 47d and Fig. 49b. 16%

The first example is figured to illustrate a stage in the manufacture of these types, showing the bold free flaking and the initial secondary work on the pointed end. Presumably the manufacture was stopped at this stage since the point was sufficient in itself without further work. Fig. 49b shows the form of the most common of the pyriform bouchers, small, pointed, occasionally with some cortex on the butt end, symmetrical in section, thickening towards the butt, uniform and symmetrical in outline, but edges not very well trimmed. It may be that these are reduced by re-sharpening.

Triangular. Fig. 49a 12%

This is the only other form which is reduced and, of course, may be closely related in function. The coarseness is accentuated by re-sharpening, since the finer secondary work is removed in the process. Like the small pyriform it may have been made to this scale in the first instance, as indicated by the unfinished example Fig. 49d. There are about 18 per cent of unfinished bouchers in the collection, the intended final form being doubtful.

Linguate. Fig. 48a 4%

In this group was found the finest of all the bouchers, the one figured. It has been made on a large flake, much of the flake surface being utilised as part of the side illustrated. This imparts a slight flattening to the otherwise very regular lenticular section. The finely uniform outline and straight edges have been achieved by the use of controlled step flaking in secondary trimming.

Cleavers

One example from Chak Sighu, Fig. 47a, illustrates the cleaver technique of that group to compare with the cleaver from Morgah, Fig. 50b. Of the total number of bifaces 38 per cent are cleavers, which is nearly normal for typical Upper Stellenbosch industries in Africa. There are three main forms of cleaver (90%), and most of the types of cross-section are present. In this the complex is typically advanced Stellenbosch.

Rounded quadriform. Fig. 50a 50%

The remains of the large preparatory flake surface are quite plain, though much has been removed in the illustrated specimen. It is nearly biconvex in section, the trimming from both sides just failing to meet in the middle. In this specimen an interesting feature is the large and deep notch in the cleaver end, a feature which occurs on two other pieces. The utilisation or retouch of this notch is directed from one side only, and its appearance, on what one would naturally take to be an axe-form of edge, raises interesting speculations as to the exact function and operation.

There are four types of cross-section with this form. The parallelogram and segmental are least common. The biconvex (with its nearly diamond-shaped variation) and the bi-trapezoidal are frequent. In

the last form the working is taken over the whole of the butt-end, but much of the main flake surface remains on the working end.

Triangular. Fig. 50b 20%

On these much of the main flake surface remains, as appears in the illustration. The trimming seems to be concentrated on the production of the main outline rather than the section, which is limited to an asymmetrical bi-trapezoidal or the simple trapezoidal, with working from one side and in one direction only. The small irregularity and thickening at the position of the original bulb is consistent. This tool is the finest form of the cleaver.

Rounded triangular. Fig. 50c 20%

This form is midway between the other two described. The secondary trimming is carried over most of both faces as in the quadriform, and the cross-section therefore approaches the bi-convex. On the other hand the outline resembles the triangular except in the terminal rounding, which is the result of the extensive working.

Cores

The core-flake element is remarkably simple. There are three types of core; the undifferentiated *asymmetric core* which, in effect, is merely a shapeless piece with flakes removed in such a way as to require the minimum of preparation or none at all—50 per cent; the proto-tortoise core—20 per cent; and simple disc core—30 per cent.

Proto-tortoise core. Figs. 51a and b.

The faceting is of the simplest kind. Small narrow flakes are produced, yet none were found on the site. Fig. 51b is interesting in being made on a flake, and may have been originally a reduced flake-boucher used as a core.

Disc core. Figs. 51d and Fig. 52f.

The first shows the reduced form and the second the somewhat undeveloped character of these cores, their lack of regularity in preparation and outline.

Flakes

The flakes appropriate to the developed cores are missing from the assemblage. In fact very few flakes were found, the most outstanding being large, plain-platform flakes, Fig. 51c, with the edge opposite the bulb trimmed by free percussion to give a regular convex working edge. Some thick flakes, Fig. 52 b, may have come from preparation of the advanced core types, and others, such as Fig. 52c, from the manufacture of bouchers, both figured flakes being retouched either to a point or rough convex edge. Fig. 52d is also a thick flake which may have been originally a cleaver, but on reduction, was utilised to a steep, convex, terminal edge.

C. Upper Soan Stellenbosch (Punjab)

This is the industry of Morgah. It carries the elements described above for the Upper Stellenbosch, and in addition, the Soan Types described below. These Soan artifacts are much cruder than the contemporaneous Upper Soan B but could be equated with the earlier Upper Soan A from which, it is believed, they are derived by contact.

All Soan Types, except the terminal flat-base and the pointed, are present, and the large side-worked flakes already described may be regarded as additional forms of Type 2, the unilateral flat-base.

Type 2 Unilateral flat-base: 15%

Fig. 53a is fairly typical, rough in shape and boldly trimmed.

Type 3 Bilateral flat-base: 35%
As in the Upper Soan the trimming may be extended all round the periphery. Fig. 53c is typical of the Middle Soan boat-shaped artifact, the base being a large scar which does not quite cover the whole of the ventral surface. Fig. 53d is the truncated cone form with deep resolved flaking and strong, terminal over-hanging edge, somewhat pointed, believed used in a gouging-scraping operation.

Fig. 53b is the truncated cone with flat, cortical, ventral and dorsal surfaces, trapezoidal in section, somewhat worn at the edges as if rubbed. Such rubbing tools have been found in the Middle Soan, (Fig. 26c, p. 127). Here the smoothed or rubbed edge appears not only on the trapezoidal Type 3 but also on large flakes, Fig. 54a, and on Type 4, convex oblate,

with cortical ventral surface, Fig. 54b. The rubbing has removed faceted projections and smoothed the outline.

Type 4 Convex oblate: 10%

The faceted rubbing tool form is illustrated, Fig. 54b.

Type 6 Unilateral nucleate: 10%

Fig. 52a is small and typical. The utilisation of the working edge is more than distinct.

Type 7 Peripheral nucleate: 25%

The tools are typical.

Type 8 Turtle-back: 5%

Fig. 52g. It is here difficult to tell whether a boucher has been contemplated, for an ovate could apparently satisfy the functional need for such a tool. It may be that some social significance is attached to this tool form (as the sumatra form in Queensland), and hence it would be made in the traditional manner.

CHAPTER XI

PALAEOETHNOLOGY

The chief end of archaeological studies is the discovery of the ways of living of prehistoric peoples. For the Lower Palaeolithic such discovery is limited; we can infer only a few elements of the various technological complexes.[1] Wood and bone implements may have been extensively used, it is impossible to say for certain. Inferences are also limited in scope for they are based mainly on comparative technology and, since these early stone age peoples must have practised a very elementary culture, we can draw comparative examples from only a few of the most "primitive" of stone-using cultures of the present day, such as the Australian-Tasmanian. Other stone-using cultures, Eskimo and Bushmen, provide some ancillary information. The earliest comprehensive study of this kind was Pfeiffer's.[2]

In Chapter IV the logic of current terminology of artifacts was questioned on the point that words which imply function cannot be used as descriptive of artifacts, (except when there is no doubt as to how the artifacts were used). The use of the word "hand-axe" is typical. By definition an axe is a tool for cutting and splitting timber, and consists of an axe-head attached to a handle by which it is swung. The addition of the word "hand" implies that there was no such handle in Lower Palaeolithic times, and that the tool (the head) was clasped in the hand, the arm of the user being the handle. The Acheulian bouchers, especially late Middle and Upper, could not be used in this way mainly because the sharp edges of the so-called butt, (the portion supposedly held), would tear the flesh. This argument applies not only to flint and obsidian bouchers but also to quartzite. We must assume that the developed types were hafted in some way, an assumption that may not be necessary in the case of the early Chellian type with roughly trimmed or untrimmed butt.

Furthermore, on comparing it with existing forms, the form of the boucher does not suggest that it was used for cutting and splitting timber; the operative portion of the tool is the pointed end, a constant

(1) In this chapter Lower Palaeolithic technology alone is discussed.
(2) Die Steinzeitliche Technik, Jena, 1912.

feature of the boucher, and such a point, often quite thin, could not be put to that use successfully. In no modern primitive culture is such a form utilised for that purpose or for one even remotely associated—unless it was employed as a weapon for "splitting" heads. But "splitting" is there improper and should be "piercing". A point has a piercing function.

Being a point the boucher may have been a digging tool. Leakey[1] suggests this, but follows it up by admitting that a pointed piece of wood would be better. And if the boucher had been used for digging a far greater proportion of those found would have shown signs of wear. This wear would take the form not only of breakage and chipping (especially of the thin specimens) but also rubbing. On none of the thousands of specimens in quartzite, flint or obsidian, which we have handled was there any sign of rubbing. It is highly unlikely that the boucher was used as a digging tool.

As Leakey points out, the Chellian boucher is a somewhat clumsy tool (held in the hand) for cutting and skinning animals. The so-called "scraper" which often accompanies the boucher would be much more suited to these functions. Leakey also found that cutting and trimming, even of small branches, with a pointed artifact like the Chellian boucher, requires both patience and perseverence, (op. cit. p. 74). With this we agree, and go further in suggesting that even the advanced Acheulian boucher would be a clumsy tool in cutting and skinning animals, and in chopping and trimming wood.

The evidence for boucher operation and function is five-fold:

(a) the operative portion of the boucher is pointed; hence some form of piercing activity is indicated.

(b) this point may be quite thin and narrow and thus easily broken; therefore the object to be pierced was not hard like soil or timber.

(c) there are comparatively few signs of wear such as chipping, breakage or rubbing; this also suggests that it is unlikely that the boucher was used on harder materials, on timber splitting or on digging.

(d) in post Chellian times the boucher was almost certainly hafted.

(1) Adam's Ancestors, London, 1934, p. 75.

(e) great care was expended in manufacture; among modern primitives such care is usually confined to implements of importance, mainly to weapons or to instruments of ritual significance and not to tools of everyday use. These latter are generally made on the spot and whenever necessary.

We infer that the boucher was part of a hafted weapon of offence or defence either in war or against animals, or both. On account of the range in size and weight, it seems that the boucher was most probably hafted perpendicularly to the handle and not in line as a spear, lance or javelin; in[1] other words, the boucher was probably the head of a battle-axe or a short halberd-like weapon. We conclude from this inference, and from the high proportion of bouchers among tools at domestic sites, that the "Acheulian people" practised a warlike and, or, hunting culture. If the weapon was used for hunting, the prey must have been large animals; and to hunt with these sometimes heavy tools required a physique probably equivalent to that of modern primitives, excluding the Negrito-Negrillo races.

The *cleaver*, with an operative edge well suited to cutting and splitting, was more likely than the boucher to have been used as an axe (Leakey, op. cit. p. 78). Like the boucher, and for similar reasons, it was probably hafted. Perhaps it too was used as a weapon. It may have been used for cutting the carcases of large animals, the trimmed straight edge being well adapted to dismembering. Even today butchers use a "cleaver", a short-handled axe for cutting up carcases. Pfeiffer also illustrates the way in which a large, suspended carcase can be flensed with a straight-edged axe or hammer. The lack of wear of the terminal edge again suggests that it was not used for digging.

Of some significance is the limitation of the Stellenbosch cultures to Africa and India and generally to deposits which indicate greater rainfall than at present and hence wider extension of forest. Australians use stone axes (of cleaver shape, and polished) for cutting steps in the bark of trees to enable them to climb after animals and honey. Similar axes are used for cutting off slabs of bark to make receptacles. (Those Australians who "fell" trees—which they do but seldom—do not use an axe but a large tool of Soan Type 2 and 3 held in both hands.) It was not until post-Lower Palaeolithic times that tree-felling was a common practice, and then in food-growing cultures.

(1) In the latest stages of development it is possible that small bouchers were hafted as spear, lance or javelin heads, an innovation to be discussed in another book.

From considerations such as these it seems that the use of a tool name implying a specific function or functions is misleading and liable to give a distorted palaeoethnological picture; and tool names of this kind are not suitable for taxonomic purposes. Moreover, in a semantic sense, a tool name is not logical for it is the result of inference based on inference. Operation is inferred first and the tool name based on that. It is as if we say when discussing, for example, the cleaver, "we infer the operations of cutting and splitting so we infer the function of cleaver tool". In Chapter IV, the tool name "hand-axe" was discarded but the name "cleaver" was retained since it could be used as descriptive of form and technique alone and not function. This we admit is a highly dangerous straying from the logical semantics of classification, but we believe that it has led, and will lead, to no difficulties or distortions. But such aberrant terminology can lead to confusion, and we take as example the use of the names "chopper" and "adze".

"To chop" is to cut something roughly, or to cut into small pieces, by striking with a knife or axe with rapid sudden blows or strokes. Thus a wood-chopper is used to cut wood into small pieces, and a meat-chopper to cut up meat. An axe or hatchet is used to "chop" down trees. The word implies in its essentials the concept of rapid blows or strokes, whatever kind of tool is used for cutting in this way. The word "chopper" without the qualifying adjective then means a tool for cutting by rapid sudden blows or strokes, and as such is synonymous with the word "chopping-tool". The word chopper has been applied indiscriminately to stone artifacts which tend to be heavy and comparatively large, and to have one side trimmed as a working edge, the other presumably being the part held. But Movius[1] has seen fit to employ the two synonymous words, choppers and chopping-tools, to distinguish two forms of stone artifacts occurring in the Anyathian of Burma, and thereafter applied these names to Soan types of tools described above. The definitions are:

Choppers: "Admitted when dealing with those implements commonly referred to as crude scrapers, massive scrapers or choppers, no hard and fast rules can be made, since the terms themselves are synonymous". (Movius means the tools are similar, for the terms are certainly not synonymous). "For the most part choppers have round, semi-oval or almost straight cutting edges which have been formed by the removal of flakes on the upper surface of the implement only, but certain types of choppers are flaked, albeit not extensively, on the lower surface as well".

(1) The Stone Age of Burma, Trans. Amer. Phil. Soc., Vol. XXXII, Pt. III, 1943.

Chopping-tool: "This term is used with reference to a well-known form of implement, the cutting edge of which has been produced by alternate flaking. Chopping tools are always core-implements usually made on pebbles, and they have sinuous edges".

Movius does not state how he concludes that these implements were used as choppers for cutting with rapid blows. What they were used to chop is also mysterious considering their extraordinary dominance in the Anyathian collections. Movius continues this semantic waywardness thus:

"Since they apparently represent a type of chopping implement rather than a tool intended solely for scraping, and since they are worked only on the upper surface of either one or, in some cases, of both ends, they clearly belong to the adze rather than to the axe family of tools. It is therefore proposed to define more precisely the much overworked term "crude or massive scrapers", in order to classify these core implements, and the name "hand-adze" is suggested for them", (op., cit. p. 351). There can be no doubt that Movius is thinking in terms of operation and function when he uses the expressions "type of chopping implement" and "intended for scraping". The distinction between adze and axe is also one of function but compounded with form and technique. As we have seen "axe" implies cutting and splitting timber, and "adzes" are used to cut away the surface of the wood. Since he nowhere defines the word "adze", we must assume when he uses the word "hand-adze" he means a tool for cutting away the surface of wood. Movius then goes on:

"It should be made clear that the criteria used in this report for distinguishing the various categories of implements are based on the form and technique of manufacture of the tools themselves, rather than on their presumed function. As stated above, practically all the material consists of core implements used for chopping, cutting and scraping; indeed it is very likely that many tools served all these purposes. It is therefore clear that form and technique, rather than function, must be used as a basis for classification. In other words, when the term chopper is employed, reference is made to a special shape of tool manufactured in a particular manner, rather than to an implement intended solely for chopping". He makes confusion worse by "a hand-adze is a type of chopping implement of roughly tabular form", (note that he writes "chopping" and not "chopper"), and "hand-adzes may be regarded as a special class of chopper, but of square or rectangular rather than of round or oval form", (op. cit., p. 351). Then he completes the non sequitur by "double end choppers......really a double-ended hand-adze which has been used for chopping, as demonstrated by the stepped

flakes removed from the lower surface. These would not have been detached if the artifact had served only as an adze", (op. cit., p. 359).

Thus it seems that, when a functional name has been given to an artifact, the function tends to be postulated, even though cautionary remarks have been made to the effect that distinctions are made on the basis of form and technique. How the original manufacturers intended to use the tool, and for what purpose, may well be far different. To find these original functions and operations the palaeoethnologist has two methods available to him:

(a) *Operational inference:* He can infer operation, the way in which a tool has been used, and thereon infer function, the purpose of the operation.
(b) *Comparative technology:* He can observe the use of stone tools by modern "primitive" peoples and, if similar tools are found in prehistoric industries, he can infer similar operations and functions.

The first method is that used by most prehistorians in applying nomenclature of the kind dismissed in preceding paragraphs, dismissed not because the method is invalid but because of the nomenclature based on it. The method is valid to the extent that operation can be inferred but, as said before, to base a second inference (of function) upon this first is a weakness which the palaeoethnologist must avoid if possible. Whereas in normal comparative technology this weakness is not inherent. The assumption that these Lower Palaeolithic peoples practised a primitive form of culture is a sine qua non, and there is only one inference, one based on sound principles.[1] We therefore apply the second method as far as we can, falling back upon the first if necessary. The type terminology we have adopted (on other grounds) lends itself admirably to this method. If we had given tool names to artifacts confusion would have been inevitable.

Since form and technique of the artifact are firstly related to operation, and since one operation may be involved in several functions, it follows that the usage of stone tools among modern "primitives" should be classified firstly in terms of operation, as follows:

(a) *Cutting-slicing:* For this operation flakes are generally used, struck as "blades" from conical cores, but also as other kinds of flake

(1) The same weakness in logic argument has been ignored by those prehistorians who claim "magic" or "religious" function for cave art. Comparative ethnology gives not the slightest support for this inference.

from other cores. Such blades are used by the Australian aboriginals, but Baldwin Spencer has this to add: "In the first place the nature of the stone (quartzite) out of which they are made renders them unfitted for cutting hard material such as wood. They can only be of much service for cutting flesh and it is, in reality, for this purpose that they are made." Such blades are well adapted "for cutting through the skin and flesh of animals on which the native feeds. In addition to this they are constantly used during fights and ceremonies".[1] Spencer noted that the flakes with terminal or lateral trimming from one side only was also used for cutting skin and flesh, and larger flakes with a stronger edge for cutting wood. Basedow also describes flakes for cutting.[2] Blades used on spears, lances, and pick-heads for war-like purposes have a cutting operation as well as the main operation of piercing.

The Tasmanians, according to Ling Roth, used Soan Types 2 and 4 for "cutting spears",[3] and describes one as "a heavy, thick stone with a rough edge (which) was probably used for cutting wood". The Andaman islanders, who have shell skuomorphs of stone tools, use sharpened shells for cutting seeds and yarns. For meat, which is softer, they use bamboo knives. Shell knives are also used for cutting leaves for thatching huts.

(b) *Gouging-chiselling:* The Australians use small flakes retouched on one end or side from one surface, and mounted (hafted) with resin on the end of a stick, for excavating wooden and bark receptacles, and for reducing and smoothing outlines and surfaces by gouging out long narrow channels in the wood or bark. This form of planing by gouging is typical of Australian wood-working. Spencer (op. cit., p. 500) calls the tool an adze, and the flake is described as "typically plano-convex in section and a convex cutting edge. One surface is always distinctly convex and is left perfectly smooth". That is, there is unidirectional retouch.

There is no description in the literature of the method employed by the Tasmanians (who had no axe) for detaching bark from trees and we must presume that the Australians also used some other stone tool before they adopted the axe. Since the whole Australian-Tasmanian complex of woodworking surrounds the operation of gouging (apart from "axing") it is not surprising that the bark for making receptacles was detached by a gouging operation, indeed, it is difficult to visualise

(1) Spencer, B., Wanderings in Wild Australia, London, 1928, p. 508.
(2) Basedow, H., The Australian Aboriginal, Adelaide, 1925, p. 364.
(3) Roth, H. Ling, The Tasmanians, 1840, p. 158.

any other method. Mountford describes this: the "cut" was made by a gouging tool, in other words a strong form of point with a strengthened back.[1] A Soan Type 3, used by the Australians for felling trees, where felling was carried on, is also well adapted to this purpose of bark detachment, having a strongly backed point at each end. It is not too wild an assumption that the tool used for timber work be used for an associated operation. In the Soan assemblage these tools are occasionally fashioned as if to emphasise the points or gouging parts, *e.g.* Middle Soan A, Fig. 22a, and Middle Soan B, Fig. 25a. The strong point in Soan Type 5 of the earlier stages of the Soan would lend itself admirably to the same purpose. (The Acheulian boucher would not be strong enough, though a Chellian would be appropriate).

Eskimo make slots and holes in wood and bone by gouging with a small end-scraper. (The burin of the Late Palaeolithic was probably used for gouging-chiselling function but there is no proper evidence of the burin in earlier periods).

(c) *Chopping-hacking:* This operation has already been discussed, when we concluded that the boucher was not used for chopping, but that the cleaver might have been—a first method approach. Proceeding on the second method—among food-gatherers of today the axe is not used for chopping down (felling) trees. Those Australians who do fell trees use large split pebbles of Soan Types 2, 3, and 4 held in both hands. But some Australians use quartzite bouchers and polished axeheads, hafted as axes, for "cutting steps in the bark of trees to enable the natives to climb up the trunk" after animals and honey, using the axe with a chopping motion (Spencer, op. cit., p. 499). The Tasmanians, who did not have the axe, used Soan Types 2 and 4 "to cut notches in the trees for climbing", (Roth, op. cit., p. 157). We presume this "cutting" was a chopping operation. As far as we know chopping as an operation is limited to these two functions, (of food-gatherers). It might be that the Tasmanians used the original technique—with Soan Types 2 and 4—and the Australians adapted the axe by reason of culture contact with a food-growing people, of which contact there is quite extensive evidence.

(d) *Piercing-boring:* Here the point is the operative part of the artifact. The boucher, as we have demonstrated, was designed for the operation of piercing, probably in functions of war or the hunt. (Similarly the "point" of classical prehistory was most likely intended for an

(1) Mountford, C.P. An Unrecorded Method of Manufacturing Wooden Implements by Simple Stone Tools, Trans. Roy. Soc. S. Austr., Vol. 65(2),1941 p. 312.

arrow or a lance, and thus for a piercing operation. The blades of the Upper Palaeolithic, like those of the Australians, were perhaps put to the same use). The Australians used pointed flakes, "splinters of stone for making holes through skins of animals which they made up into rugs", (Basedow, op. cit., pp. 363-5). The late Soan Type 5 may have been used in this way. The Eskimo used stone for a similar purpose where a bone needle, for fine holing, was not necessary. Thin bone drills (Qere) are also tipped with stone but no stone artifacts of this kind are known in industries earlier than the Upper Palaeolithic.

(e) *Pounding-smashing:* In these operations there is implied recurring series of strokes for reducing an object to pieces by breakage, (as distinct from cutting in the operation chopping). The "hammer-stones" of modern peoples used for chipping stones, have their well-known and easily-recognisable counterparts in the Old Stone Age. Basedow (op. cit., p. 360) writes that the Australian aboriginals use "oblong and rounded pebbles (from river beds) for pounding and cracking....seeds and foliage....pulverising ochre, cracking nuts and hollow bones containing marrow". According to Spencer, (op. cit., p. 500), the Australians used "ordinary and roughly-flaked stones for use on the spur of the moment, when they are wanted for such a purpose as to smash a shell open or crack a bone to get at the marrow". As far as we can make out these artifacts, "left lying about on their camping places", were Soan Type 1, 2 and 4.

(f) *Rasping:* This operation is used in two functions, (i) for roughening surfaces, and (ii) as the carpenter uses a rasp, for outlining shapes by rough scraping.

(i) The Tasmanians used Soan Type 1 and 2, or a flake trimmed in the same way, for "making the handles of waddies rough, so as not to slip from the hand", (Roth, op. cit., p. 157).

(ii) The Australians "select a flat fragment of rock into one straight side of which they chip a shallow concavity; this instrument answered the purpose of a rasp when finishing off such articles as spears, waddies and clubs which had cylindrical, convex or curved contours to bring into shape". (Basedow, op. cit., p. 366). This notch, which occurs so frequently on palaeolithic artifacts, seems to have been used in this function—more is said about it under "scraping".

Basedow also writes, (op. cit., p. 362), "haphazard rock fragments of sandstone with at least one broken surface are extensively made use of for rasping and smoothing down the sides of boomerangs and other

wooden articles". Similarly, when making spearheads,—"occasionally the edges are rasped with a flat slab of sandstone at right angles to the plane of the flake—a process which breaks away small chips from either side of the edge which is being rubbed", (Basedow, p. 368). This is a form of retouch. The sandstone so used is smoothed to a bevelled edge reminiscent of Fig. 54a, a large flake, and a Soan Type 4, convex oblate, which have smoothed or rubbed facets of this kind.

(g) *Rubbing-grinding:* These clearly related operations are used in different functions.

(i) Rubbing-grinding, as smoothing or scraping is used, in "finishing off" polished stone tools such as axes. In general the object to be rubbed or ground is held, and finished against the abrasive stone, the latter being large and fixed. There are no artifacts of this kind that concern us here.

(ii) Grinding to reduce materials to very small fragments is used by non-food-growing peoples—in other words a milling action in elementary forms of the quern. Australians for example, (Basedow, op. cit., p. 361), grind seeds with what they call a "miri". "River-worn pebbles, measuring four to five inches in diameter, are also used extensively....in conjunction with a large flat slab as a hand-mill". The woman "works the pebble forwards and backwards with her hands, rocking it gently as she does so". The miri "eventually acquires a levelled or convex grinding surface. Fine-grained sandstones or quartzite are most commonly found in use". The miri are carried about on the march. Though not of the typical miri form the advanced bilateral flat-base, Soan Type 3, which has become trapezoidal in section, may have been used for this purpose, *e.g.* Fig. 26c, Middle Soan B, p. 127. It has been found in quartzite, Fig. 53b, and in sandstone, Fig. 56b.

(h) *Skinning-flensing:* The removal of the skin of animals is usually carried out by some kind of cutting instrument, a knife, a cleaver, a mattock (by Eskimo on whales). Blade knives are used by Australians, but the Tasmanians used flakes and split pebbles worked as Soan Types 1 and 2. The Eskimo used the Soan Type 2 on a flake—"moustierian side scraper"—but preferred the polished slate ulo, a woman's knife, nowadays made of metal.

(i) *Scraping-stripping:* These operations are closely related to rasping. Australians use flakes, "pieces which have a strong sharp edge with a butt opposite, suitable for holding between two or more fingers", as "useful scrapers with which (to) work the surfaces of wooden weapons

or implements", (Basedow, op. cit., p. 363). Basedow also refers to concavo-convex flakes being used as spokeshaves. The Tasmanians used true Soan pebble tools (Types 1, 2 and 4) for the same purposes but more often used flakes trimmed in a similar fashion. The notch chipped out of the edge of the tool was used for the final shaping out of wooden weapons and implements where the desired cross section was circular or in part convex (*see* also smoothing—planing). Very large notches were used in scraping skins, (Basedow, op. cit., p. 366). The skin was stretched over a pole which fitted the notch. The Eskimo use the ulo, (and prior to that used a flake trimmed from one direction unilaterally), placing the skin flat on a rock. The Andamanese use the shell skuomorph of the Soan Type 2 or "side scraper", for scraping the outer skin of mangrove seeds and for stripping fibres for rope or thread.[1] The Kalahari Bushman use "stone knives" for shaving down wooden bow staves, and "groved stones" (notched) for smoothing.[2]

(j) *Smoothing-planing:* These operations are not far removed from rasping and scraping. Flakes struck unidirectionally are used by the Australians for "smoothing down the handles of a spear or adze" (Spencer, op. cit., p. 502). Soan Types as well as flakes were used by the Tasmanians. Planing by gouging has already been mentioned, and the mounted "scraper" has been described as an adze. The adze as we know it, a kind of axe-head perpendicular to the line of the shaft and the operative edge also at right angles, is used only by those food-gatherers who make boats. There is nothing comparable in the Soan culture.

(k) *Digging:* Almost all modern primitive peoples use wooden implements for digging. But Jackson[3] reports that a "sumatra" type tool, Soan Type 3, common in the Hoabhinian culture of south east Asia, is used by coastal Queensland women for digging the root of a species of fern used as food.

The Andamanese, and formerly the Hottentot peoples, use quartz flakes for shaving and scarifying the skin and for cutting finger nails. On the Andaman Islands great numbers of such quartz flakes are to be found near formei habitation sites.

Some remarks by observers of the Australian-Tasmanian stone users are useful in adding to the picture it is now possible to envisage of the way of life of the Soan people. Ling Roth on the Tasmanians

(1) Brown A.R., "The Andaman Islanders, Cambridge, 1922.
(2) Dornan S.S. "Pygmies and Bushmen of the Kalahari", London, 1925, pp. 94-7.
(3) Jackson, G.K., Mem. Queensland Museum., No. 11, 1939, p. 289.

writes, "While some of these (artifacts) have been split by hand from larger blocks, others are fragments of rock occurring naturally, and selected because they were of suitable form. These fragments have been treated in one way only; having selected what appears to be the best for a cutting edge the native has improved it by simply striking off small flakes all along the edge, and from one side of the edge only", (op. cit., p. 155). "As a very general, if not invariable, rule, one surface only was chipped in the process of sharpening", (op. cit., p. 159). Here both flakes and pebble tools have been treated in the same way; *the flake when trimmed is essentially a split-base Soan tool.* Or it might be put this way—the Tasmanians used both split-base Soan tools, and pebble tools. "Also common (were) water-worn stones, broken in the edges, as if used for chipping", (op. cit., p. 157). Those specimens of Tasmanian tools we have examined in museums show preparation of flakes both by fine stone hammering and by the splitting on a stock described "Some specimens, however, have been detached by one blow from a larger rock. These exhibit a semi-conchoidal fracture and, having a good edge, have not subsequently been altered by chipping", (possibly waste-flakes). The retouch is never by wood.

Spencer writes of Australian stone tools,[1] "The nature of the stone weapon or implement, used by an Australian aboriginal is determined, primarily, by the nature of the material available". If it is quartzite the "chipped and flaked implements are as crude as Palaeolithic" but some are as fine as Neolithic. For axes the Australians repair to certain quarries—and elaborate rituals have been built up around these visits. Otherwise they always begin their stone work with large pebbles. "Ground stone implements (*i.e.* axes) are much less common than flaked ones, because material suitable for making them is found in relatively few spots in Central Australia, while quartzite—that can easily be flaked and chipped but not ground—is very widely distributed".

Soan type tools, and comparable flakes, "are met with in such numbers that one often feels very doubtful as to whether any particular stone has been artificially shaped or owes its form to natural agencies.[2] These tools "are left lying about on their camping places". The miri grinders are carried from place to place, but apparently all other stone tools are manufactured on the spot—all, except axes. Cutting and scraping tools are seldom used by women and even the pounding and grinding stones belong to the camp and not to women exclusively".[3]

(1) Spencer, B., Native Tribes of the Northern Territories of Australia, London, 1914, p. 353.
(2) Spencer, B., Wanderings in Wild Australia, London 1928, p. 500.
(3) Ibid., p. 496.

The Soan types not mentioned in the above survey of operations and functions are the nucleates, Types 6, 7 and 8. Since comparative technology gives no assistance then recourse must be made to operational inference.

Dr. V. E. Fuchs suggested to us that Types 6 and 7, with more marked undulating edges, could have been very useful in skinning animals, the undulations acting like small ploughshares in throwing up the skin on either side. Paterson has seen Dr. L. S. B. Leakey, in East Africa, skinning with an obsidian knife blade. He found the stone tool to be better than a straight-edged knife presumably for this reason, though the undulations were of a much smaller kind. (These edges have their parallels in the form of some modern bread knives, and such like, which have either offset saw teeth or undulating edges).

But sometimes the edges of the nucleates are battered and chipped (the reason for including them in the tool assemblage) which does not suggest operation in soft material alone. On account of the edge form it is unlikely that these tools were used for a pounding-smashing operation, (or cutting wood), and the only operation we can think of as possible is that of chopping-hacking. Because of the wear the materials chopped or hacked were probably hard—perhaps bones or nutshells. We hesitate to go further than this. As we have said before, it is possible that these tools were originally cores, and have been utilised in functions for which other tools were usually made. One could well visualise the hunter (or his wife) preparing flakes for skinning and cutting up a carcase, and employing the discarded core, lying at hand, to dismember bones and break them up, perhaps adding a few "sharpening" touches to make the tool more efficient.

Before drawing some tentative conclusions about the material culture of the Soan tool-makers there is some further evidence in climatic association. It has been shown that the Upper Soan industries are found in gravel beds, evidence of fluvial conditions much wetter than those indicated by the Potwar Loess and re-deposited loess above, conditions even drier than those of present-day Punjab. We may assume that, during these fluvial periods, the flora was more luxuriant, of an open woodland or even a forest type; perhaps the monsoon pine-oak forest of the southern slopes of the Pir Panjal extended on to the Potwar plain.

Food-gathering in the strictest sense must have been easier than during the loessic periods. Nuts, fruits, honey, grubs, small animals, fish in the always-running rivers, and such like food must have been

readily available. On the dry open loessic plains and in the seasonally dry rivers food-gathering was more difficult, and animals were almost certainly "chased" rather than "gathered". The material culture required for living in these dry periods would be different to that in the fluvial times. It is of little wonder, therefore, to find that the loessic industries were not those of the fluvial, (the Soan), that they were flake-blade industries with points for lances, spears and javelins, and knives suitable for game to be caught in the open country.

Here we may also contrast the Soan assemblage with that of the Acheulian biface-makers. In the latter the boucher-makers appear to have been seeking a pointed tool, and the cleaver-makers were concerned with an axe-shaped edge. In the Soan pebble assemblage, on the other hand, there seems to have been a pre-occupation principally with a convex edge. Sharpness was achieved, not by biface working, but in the simplest way—the steep edge above the fracture surface of a broken pebble was reduced in angle; just as a wood-plane blade is sharpened, in contrast to the two-sided sharpening of a razor. The contrast of working edge forms, and their intensive development in each cultural assemblage, implies that in one respect certainly the two cultures were distinct. It does not seem feasible that each is either a seasonal or occupational variant of the same culture. A distribution pattern confirms this view. As a last consideration of these Soan pebble tools, none appears to be suitable as a weapon of offence or defence in quite the same fashion as the boucher and the cleaver might have been so employed.

It is permissable to conclude tentatively that "the Soan people" were very simple food-gatherers. (The following is to be taken as possibility and in no way as certainty). They found their living in tropical and semi-tropical vegetation and associated fauna. They climbed trees to gather fruit, seeds and nuts some of which they broke or ground to pieces. They collected honey, insects, grubs and small animals, and stored them in bark (or wooden) receptacles. They dug for roots, and fished in the rivers near which they tended to settle. They used wooden tools, (finished off by notched stone artifacts), plained pointed sticks, digging sticks and clubs for killing animals. They constructed rude shelters of bark or leaves, but did not remain long at any one site; and they were sparsely distributed, as food-gatherers of this kind must be in order to find enough to live on—hence their industrial floors are neither numerous nor prolific. They were not warlike (in contrast to the Acheulian people), being aggressive only in ritual and when driven by fear, (like the Tasmanians).

APPENDIX A

THE KOTAH INDUSTRY

A small group of thirty artifacts, found at Kotah (Site 20) by Dr. E. B. Pinfold, is undated geologically, being a surface find, unworn and unpatinated. Two elements, holed stones and the use of soft sandstone, suggest at once a post-Palaeolithic date; but the survival of palaeolithic forms of a kind distinctive of the Soan may indicate a partial survival of the Soan culture, or else a culture in which food-gathering techniques of Soan kind were employed.

There are ten Soan Type tools, four of which are made of sandstone, the others from quartzite. With one asymmetrical biconical core, there are seven nondescript pieces from which flakes have been removed, and six flakes. There are two bifacially worked pieces; and four holed stones complete the assemblage.

Soan Types

Type 2 Unilateral flat-base: There are two, a large one on a split pebble, Fig. 55d, and a small, Fig. 55b.

Type 3 Bilateral flat-base: This is present in its developed form, a circular pebble trimmed from one side all round the periphery, producing a trapezoidal section. There are three, Fig. 56b, made of coarse sandstone and not of the usual quartzite. A fourth, Fig. 56a, also made of sandstone, is essentially the same but smaller and with vertical trimming, producing a rectangular section. The bases of these artifacts are smoothed, and the sides of the smaller pieces worn, as if by rubbing action. (cf. Middle Soan B, Fig. 26c.)

Type 5 Pointed oblate: This is represented by a coarse, flattened pebble, somewhat irregular in outline, with two lateral notches.

Type 6 Unilateral nucleate: Two pieces, Fig. 55c, have been used as rubbing or smoothing tools, with well-marked facets as a result.

Type 8 Turtle-back: The one specimen, Fig. 56d, is typical. The ventral surface is cortical and the dorsal is worked as finely as an

Upper Acheulian boucher. Indeed, from the dorsal aspect it looks like an Upper Acheulian cordate.

Cores

There is one asymmetrical biconical core and the seven nondescript pieces already mentioned.

Flakes

The six flakes are all fairly big, two of them showing convex edge working, Fig. 55a, rather like a unilateral flat-base tool. One flake has a straight working edge and another a notch. All seem to have been utilised.

"Boucher"

One broken piece is not big enough to show form, only technique akin to the Acheulian.

Axe

The one piece, Fig. 56c, is like a blank for a polished axe of neolithic kind. It is bitrapezoidal in section with one large flake surface—the technique of preparation must have been similar to that of the cleaver. It is coarse and lacks fine secondary working.

Holed stones

These are made of the same coarse sandstone as the bilateral flat-base tools. Three are finished but broken, and the fourth, the largest, was broken in process of manufacture. The process apparently followed this sequence: firstly, drilling of an oblate pebble from both sides, presumably by a hard, pointed stone tool, secondly, rough shaping of the outline by trimming unifacially from the base (as on the bilateral flat-base) and finally smoothing of the stone rubbing.

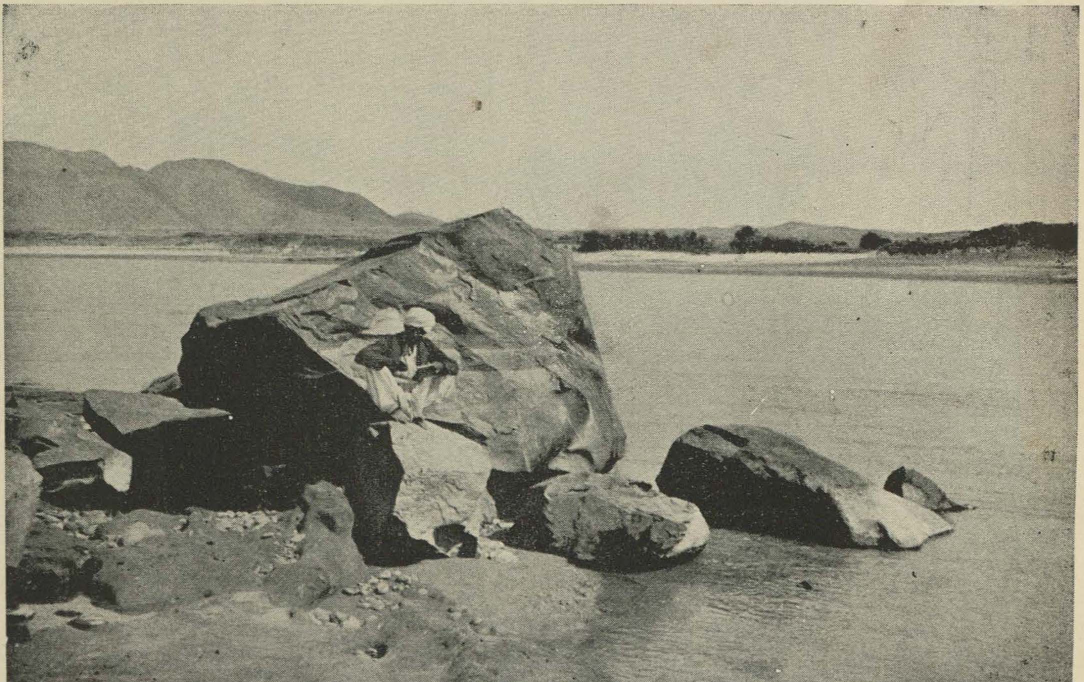
The use of sandstone for Type 3 suggests that these tools cannot have been used for cutting or digging; and the smoothed surfaces imply a rubbing action possibly for grinding, as on the Australian miri. The smoothed facets on Type 6 are new to this type of tool and are incongruous with the Type 6 working edge—the artifact may have been put to two uses.

The axe blank and the holed stones give a "feel" of the late stone age. The complex is much more primitive, however, than the classical Indian neolithic of Bellary in the Peninsula. Similar Soan Type tools were excavated at a megalithic site at Burzahom near Srinagar in Kashmir, and are associated with pottery, hoes, pestles, and polished cells.[1] Paterson excavated a site at Nunar, near Gandarbal in Kashmir and found, at a depth of seven feet in post-glacial loess, the same cord-marked and mat-marked pottery. At Burzahom this neolithic material lies below a prehistoric level of Mohendjo-Daro age.

The nearest kind of industry, found in Burma, has been described by Movius.[2] There the Soan Types are accompanied by smoothed or polished axes, a piece of holed stone and a spindle whorl. The holed stone is made differently, being thinner and lenticular in section. In Burma cord-marked pottery is also present.

Holed stones from the North West Provinces have been known for a long time, and various writers have called them mace heads.[3] But little is known about their function. They are recorded in Indo-China, China and Manchuria, according to Movius, and they appear in East and South Africa,[4] associated with the Capsian, Magosian, Smithfield, Wilton and Kitchen Midden cultures. It is believed they were make-weights on wooden hoes, but "the natives may, in the first instance, have used the bored stones left by their prehistoric fore-runners, and in the course of time have copied and used them in the manner indicated—just as many Europeans today use them as doorstoppers or as weights to keep the rope of a head-stall taut".[5]

(1) de Terra and Paterson, op. cit. p. 233.
(2) Movius, H.L., The Stone Age of Burma, Trans. Amer. Phil. Soc., Vol. XXXII, Pt. III, 1943, p. 378.
(3) Cf. Rivett-Carnac, J.H., "On Stone Implements from the North Western Provinces", Journ. As. Soc. Bengal, Vol. LII, Pt. I, 1883.
(4) For references, *see* Van Riet Lowe, C., "Bored Stones in Nyasaland", S. Afr. Journal Sci., Vol. 37, 1941, pp. 320-326.
(5) Van Riet Lowe, C., ibid. p. 324.



Erratic Boulder with Petroglyphs, Mandori

APPENDIX B

PETROGLYPHS IN THE PUNJAB

During the autumn of 1935 Paterson made a survey of the Indus by boat, from Attock downstream, and the opportunity was taken to examine some rock bruisings brought to the notice of the Yale-Cambridge Expedition by Mr. A. Macnabb, then Deputy Commissioner of the Cambellpore District in which these petroglyphs are to be found.

The presence of these rock bruisings was first noted by Theobald in a discussion of the large erratic boulders on which the bruisings occur.[1] Theobald charted the distribution of these boulders and believed them to be confined to the high flood plain of the Boulder Conglomerate (terrace of deposition, TD), but Paterson encountered them at various levels down to present river level, a redistribution brought about by a shift of the Indus from its ancestral course east of the present.

It seems probable that the boulders were brought into this district by floating ice during the second glacial period, the ice rafts being concentrated near Campbellpore at the inlet of the gorge cutting through the Kala Chitta Range in the south. During the later redistribution of the boulders it is most likely that any rock bruisings would have been obliterated, or at the very least show signs of abrasion—which they do not. Since some of these boulders are at present river level and bear unworn petroglyphs, these bruisings must be of very late geological age, coming into the category of recent phenomena.

In all eighteen boulders were discovered. One, at the water's edge on the right bank of the Indus three-quarters of a mile north of the village of Mandori and six miles below Attock, is surrounded by others which may have broken off from it (Plate III). The others are grouped round the village of Gariala (*see* Section 1) near the mouth of the Haro River where it enters the Indus. This is about four and a half miles west of Campbellpore (72°15' E., 33°46' N.). Numbers were painted on the rocks and their positions plane-tabled, but no relationship of site

(1) Theobald, W., Occurrence of Erratics in the Potwar, Ind. Geol. Sur. Rec., Vol. 10, p. 140, 1877.

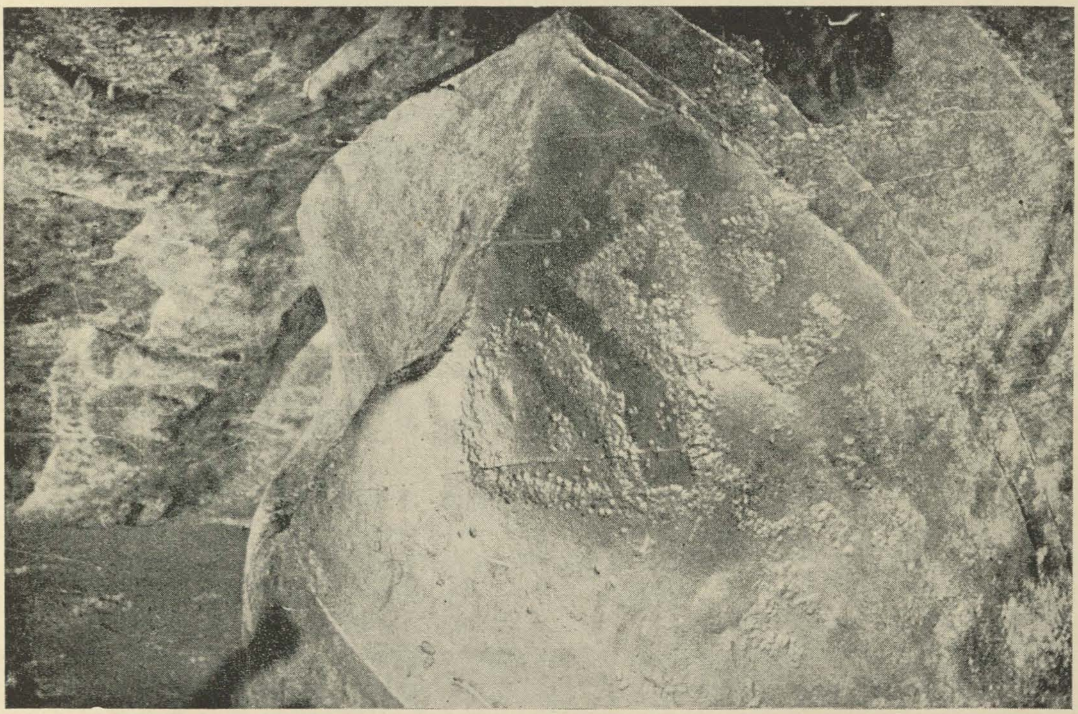
and character of drawing was discovered and it has therefore been thought unnecessary to reproduce the map.

These boulders were subsequently examined by King in 1937 and 1938[1] but he makes no mention of the numerals which seem to have been worn off by then. He provides photographs of the boulders, one like that in Plate III, but makes no figured inventory of groupings which is given here. But he describes drawings which were not exposed to Paterson in 1935. In particular is one of "a boat on a pontoon drawn overland by a yoke of oxen" which has "remarkable ritualistic parallels in Sweden" and in the Iberian cave drawings. Otherwise all of these figures (or their parallels) which appear obscurely on King's photographs are reproduced in Figures 57 to 59. Many which do not appear on King's photographs are included here. All of the figures collected are not given. No other sites were discovered on the Indus terraces south of the Salt Range.

The boulders are outstanding because of their size, and it may be this very factor that induced the artists to utilise them. They provide large ready-made "canvases" not easily to be found among the softer rocks of the local Siwaliks and other sedimentaries. The rocks are deeply patinated to a dark brown or brown-purple colour like that of the other Boulder Conglomerate constituents, and, where redistributed, contrast strongly with the younger conglomeratic material around them.

Into this skin of patina the drawings have been punched by a pointed tool. No metal marks were to be seen. These small depressions are up to 3/8 inch in diameter and are about 1/6 inch deep set closely together. (Plate IV). Since the bruising is so shallow it does not penetrate through the patina hence the petroglyphs are almost of the same colour as the surrounding surface. But nevertheless there seems to be a distinction into two ages of bruising. One, the older, is very nearly the same colour as the original patinated surface whereas the other, the younger, is lighter (at first thought to be due to deeper penetration of the skin) because the micas and felspars of the rock at the bottom of the pits are fresher and reflect the light. The older bruisings may have been like this originally and exposure has completed the decomposition of the minerals. There is an imperceptible gradation from one to the other and in no case is there superposition of younger on older; but the more conventionalised figures are more frequently of the younger age. It is doubtful if this has any significance. The comparative "freshness" of the exposed minerals is another argument for a recent dating of these

(1) Rock Drawings on the Indus, Man, XL, 1940, No. 83.



Petroglyph on Boulder at Mandori

figures. If comparison with the decomposition of exposed minerals on hewn rock at the ruins of Taxila (not far away) is of any guide, these rock bruisings are of near historical age or not much more.

Figures 57 and 58 show three characteristic groups from these boulders*. Figure 57, which we call "the elephant group", is taken from the Mandori boulder. Figure 58 is of two groups on two of the largest of the highest gathering of boulders above the Haro River. The lower we call "the trident group" and the upper "the buffalo group". Whereas the elephant group is in silhouette the trident group and part of the buffalo group is in linear outline. It is among the outline and conventionalised figures that younger bruisings are most frequently found. Figure 59 illustrates the range from the extreme of "naturalistic" human and animal figures to conventionalised symbols. Plate IV is a close-up photograph of the central bottom figure. It is at once apparent that the "elephant", "trident" and "buffalo" groups almost certainly are not the work of the same artist.

Of the *naturalistic* figures the most common is the human male, either (a) as a warrior with shield and spear on foot or mounted on an elephant (Fig. 57a) or a horse (Fig. 58a) or perhaps a dromedary (Fig. 57b), or (b) in domestic pursuits, leading a buffalo (Fig. 59a) or playing a ball game (Fig. 59b). A figure carrying a head weight (Fig. 59c) may be the only human female figure.

Naturalistic animal figures, elephant, buffalo, horse and dromedary, are almost all in silhouette, but an isolated group in linear outline (Fig. 59, Group 2) may represent a tiger and a buffalo. Here too is a curious four-legged animal with an elongated neck.

Conventionalised figures appear most frequent in the trident and buffalo groups. The trident itself may well represent a male figure for there is a fairly uniform passage from the naturalist figure with arms (and weapons) akimbo to the trident of Fig. 58b. It is then a short step to the trident proper. The complex figures of the trident group can then be interpreted as men leading or mounted upon animals, elephant, horse and buffalo. The human figure with arm on the waist (Fig. 59d) may well have developed on the line towards Figure 58c.

The circle with perpendicular diameters, and the "heart" shape with "ventricles" and "auricles", in Fig. 59, Group 3, may have been drived from the complicated trident groups. On the other hand, they

*Scale about 1/8.

may be more distinctly symbolic like the circle with centre and crossed arms (Fig. 58d) which is reminiscent of some modern Indian art Symbols—in this case, of the female.

Cuthbert King (op. cit.) writes that Sir John Marshall believed these petroglyphs to be of a late historic period, and that Daya Ram Sahni thought them very similar to many rock drawings of the mediaeval period in parts of India. These mediaeval rock drawings, as described in detail by the Gordons,[1] do not seem to us to show any close resemblance in technique, theme, character or style. Similarly the European styles and character, which King mentions, are quite distinct, (we would expect theme and character to be so).

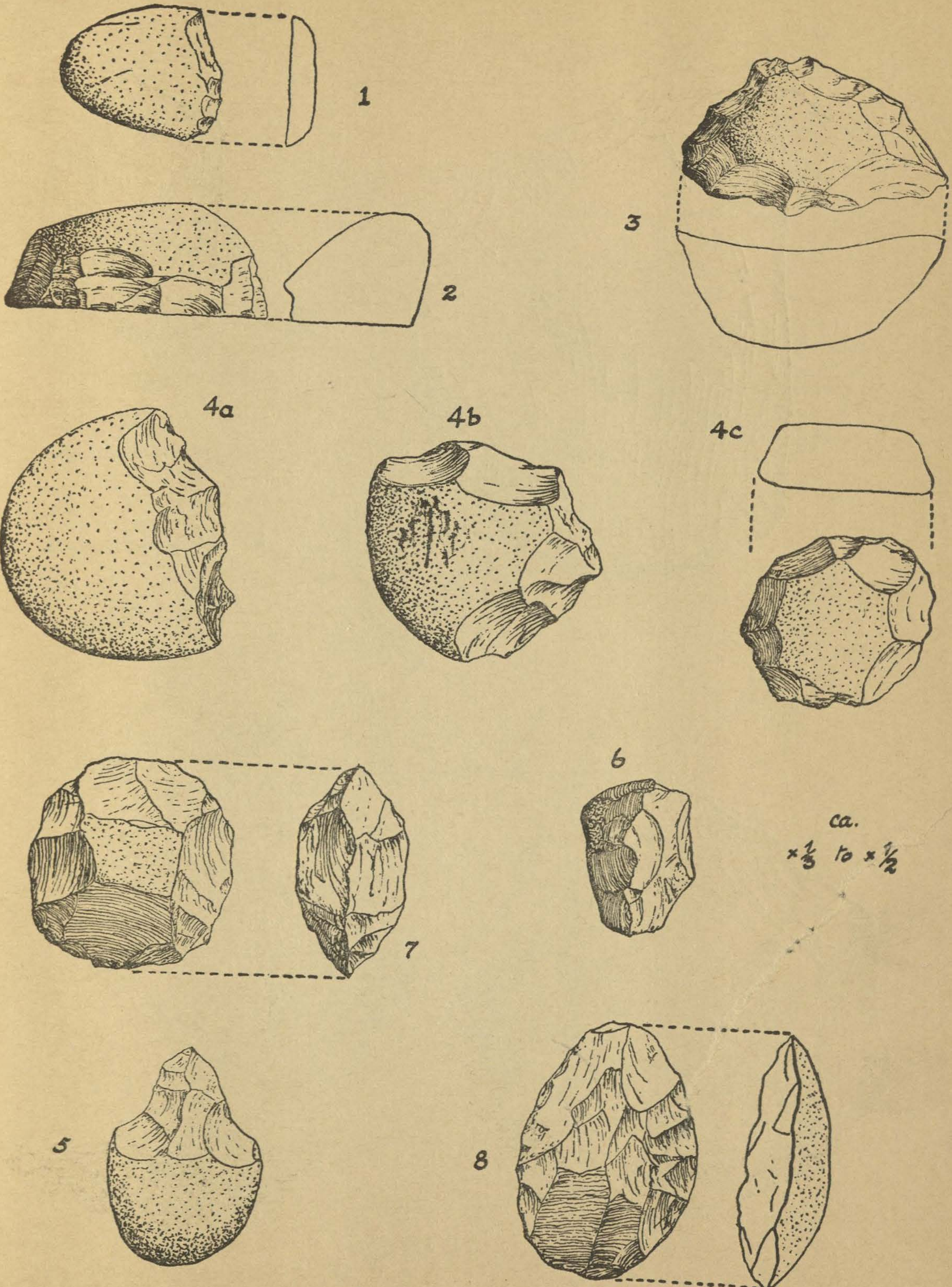
The nearest approach in technique and style is in the Libyan—Berber Art Region of Algeria.[2] These figures are punched into boulder and escarpment rock surfaces just as in the Punjab. Both linear outline and silhouette techniques are employed, the linear dominating. The cow, horse and camel are prominent, some with armed mounted men. (There are also other animals, dog and lion for example). In Algeria too the human male figure moves in conventionalisation towards the trident, but not so far as in the Punjab. Complex animal figures with curious dorsal erections are like those in the trident group here, and a seemingly final stage are the conventions (symbols) including the circle with perpendicular diameters and a figure very like that of the dissected heart. These Algerian art forms extend in time down into the Christian era.

We do not postulate any connection, nor do we wish to embark on wild speculation. This Appendix is a record of and not a dissertation upon petroglyphs and similar art forms about which we are inexpert.

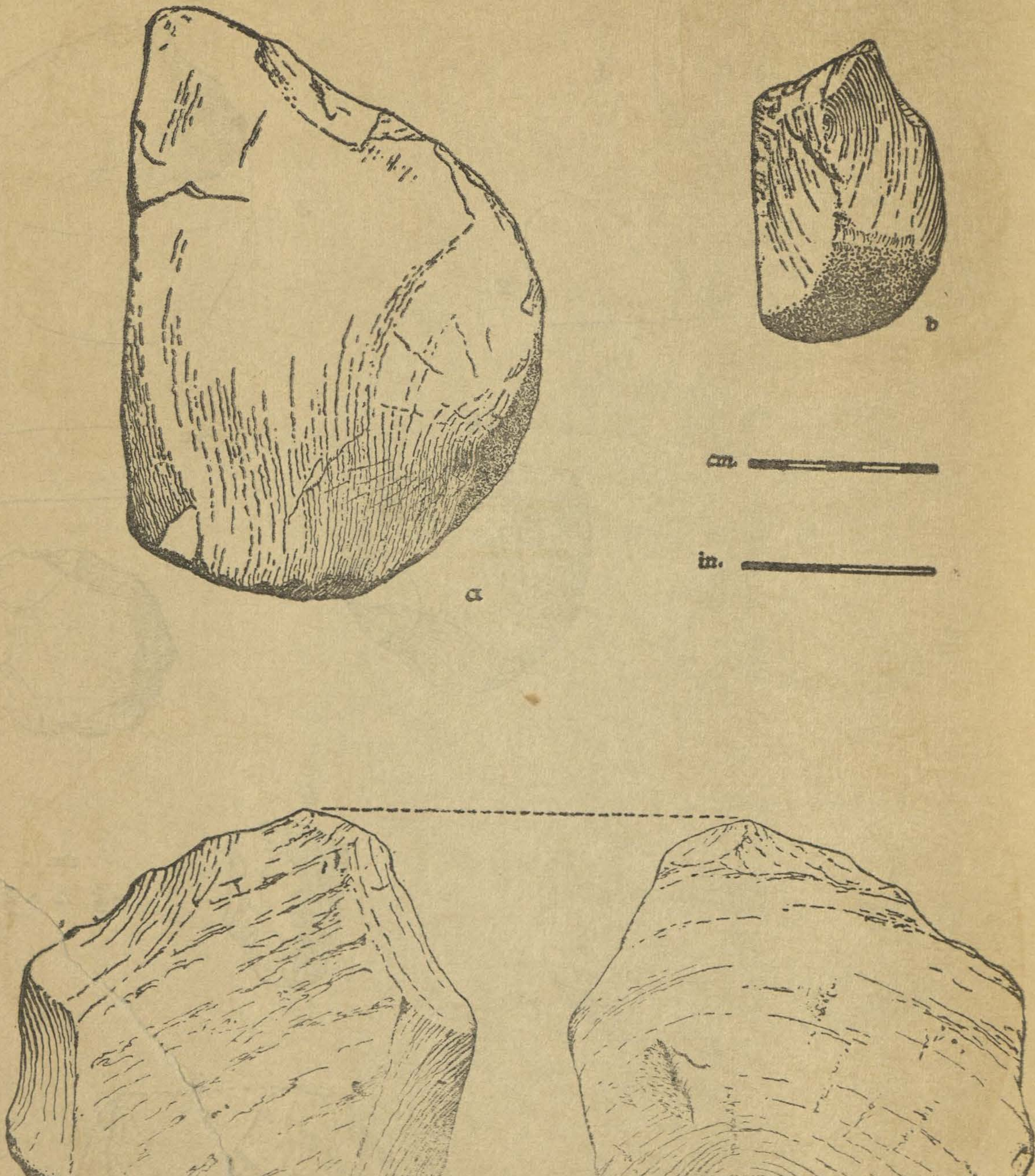
(1) Gordon, M.E. & D.H., Indian Rock Paintings, Science and Culture, Calcutta, 1932. Gordon, D.H., Indian Cave Paintings, Ipek, Bd. 1, 1935, p. 107-113.
(2) Frobenius, L., and Obermaier, H., Hadschra Maktuba, Forschungs-Instituts fur Kulturmorphologie, Munchen, 1925.

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ILLUSTRATIONS

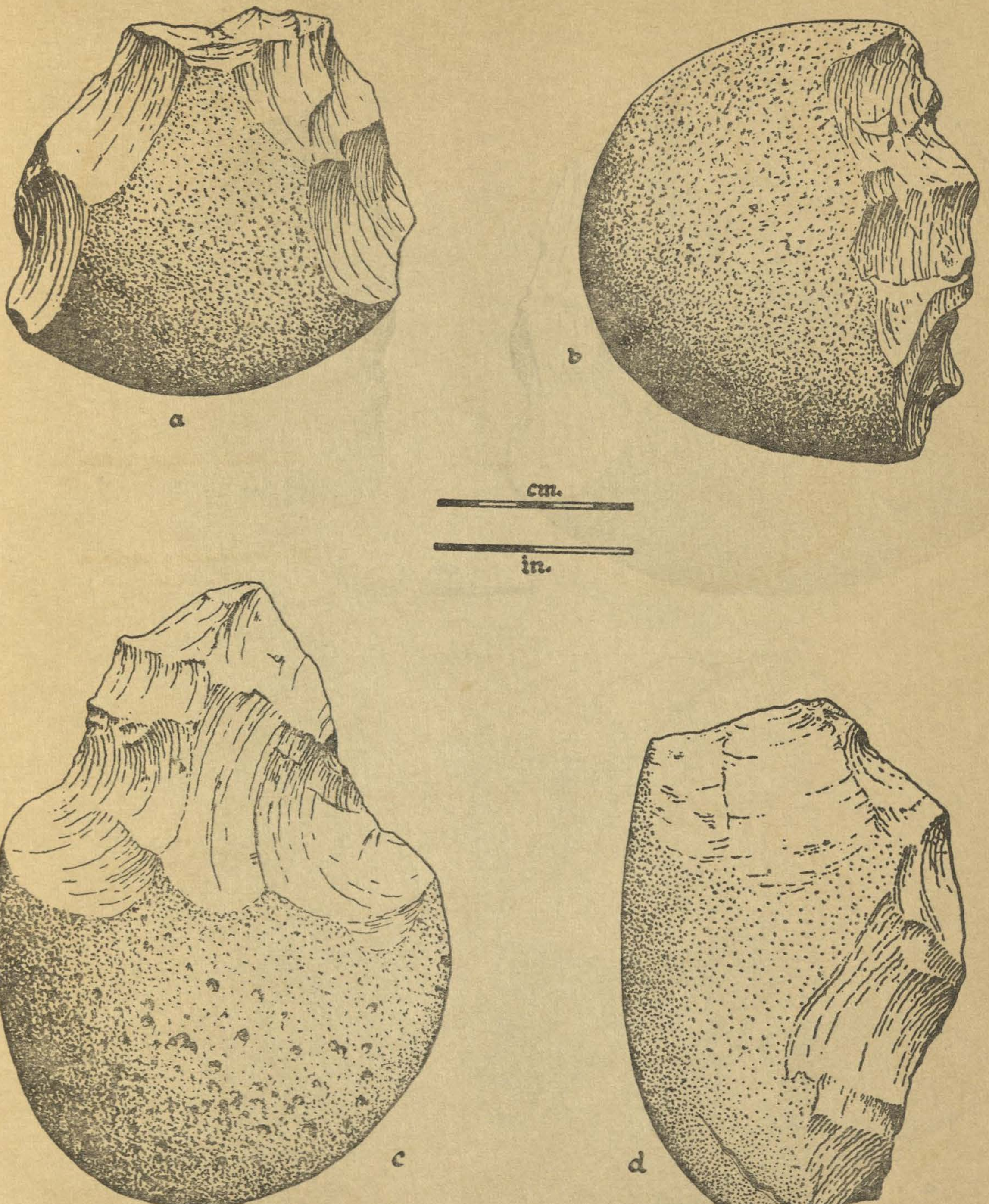


Soan Type Tools



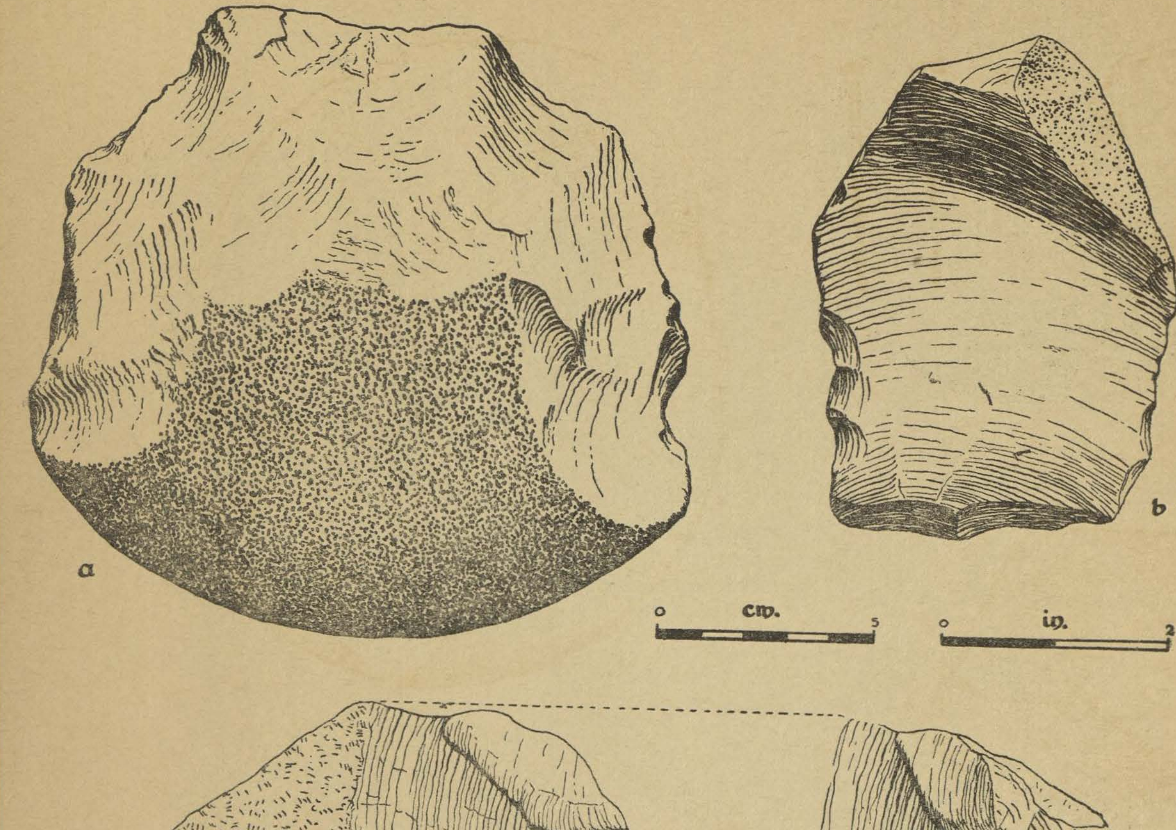
The Pre-Soan

Figure 18



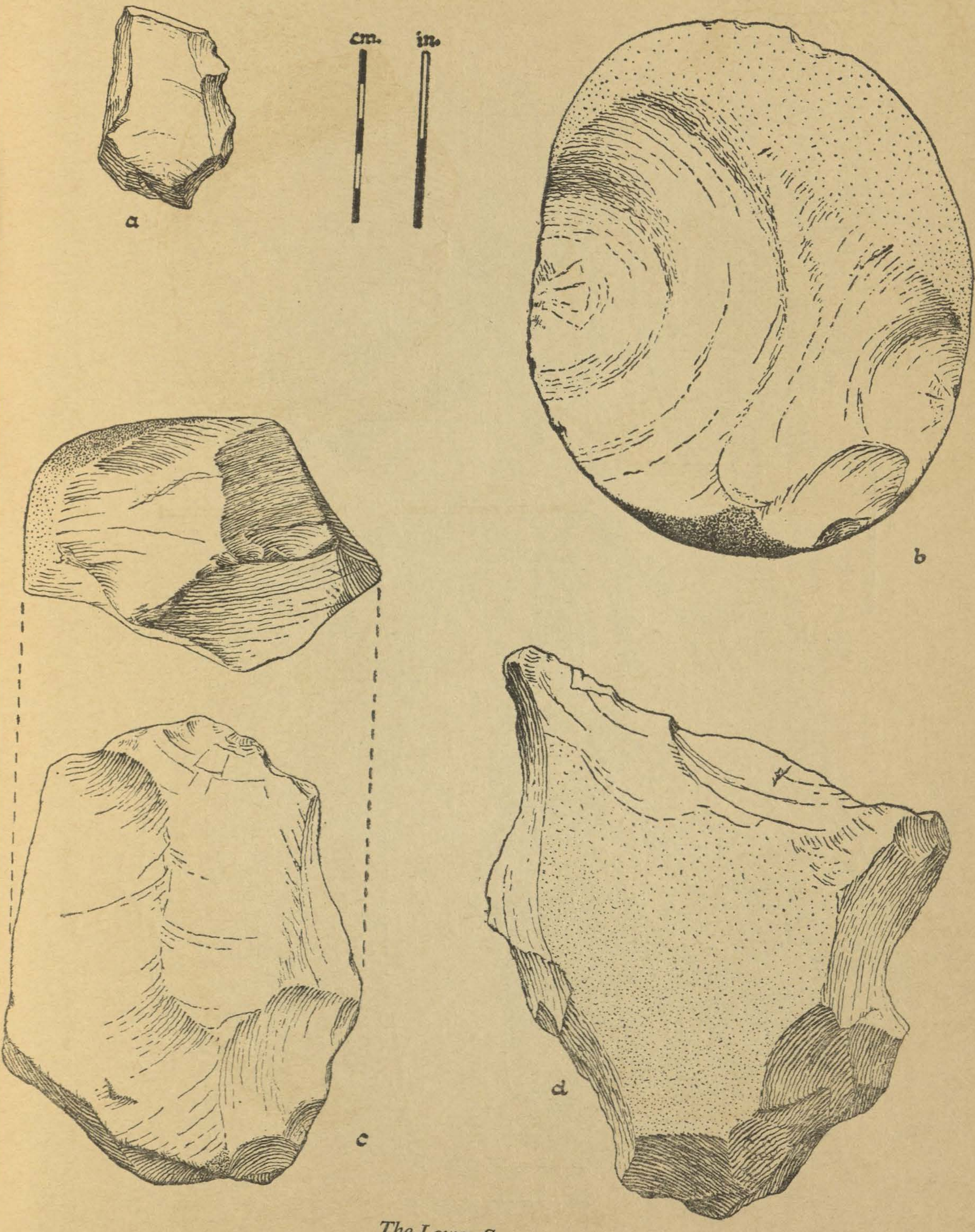
The Lower Soan

Figure 19



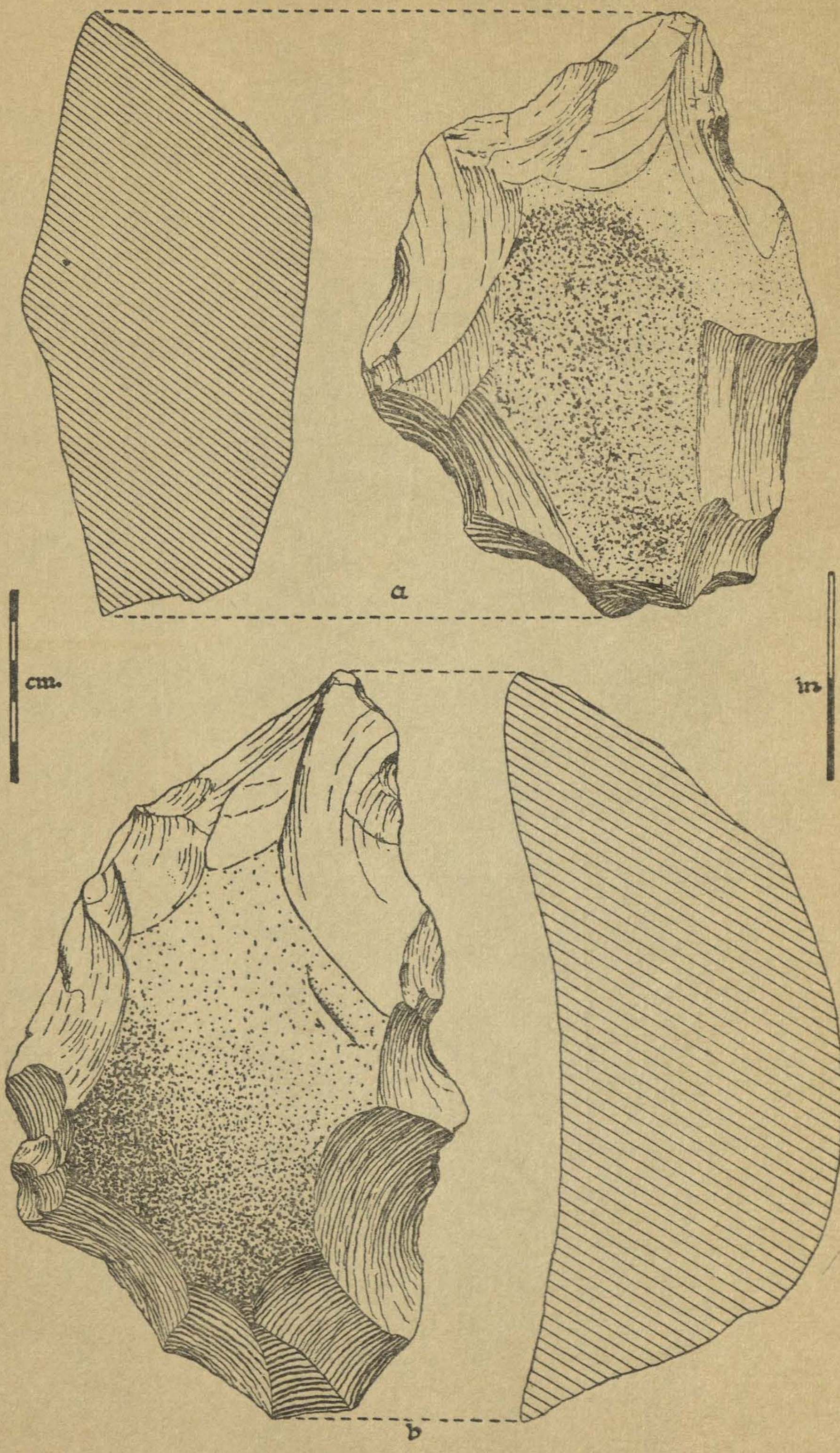
The Lower Soan

Figure 20

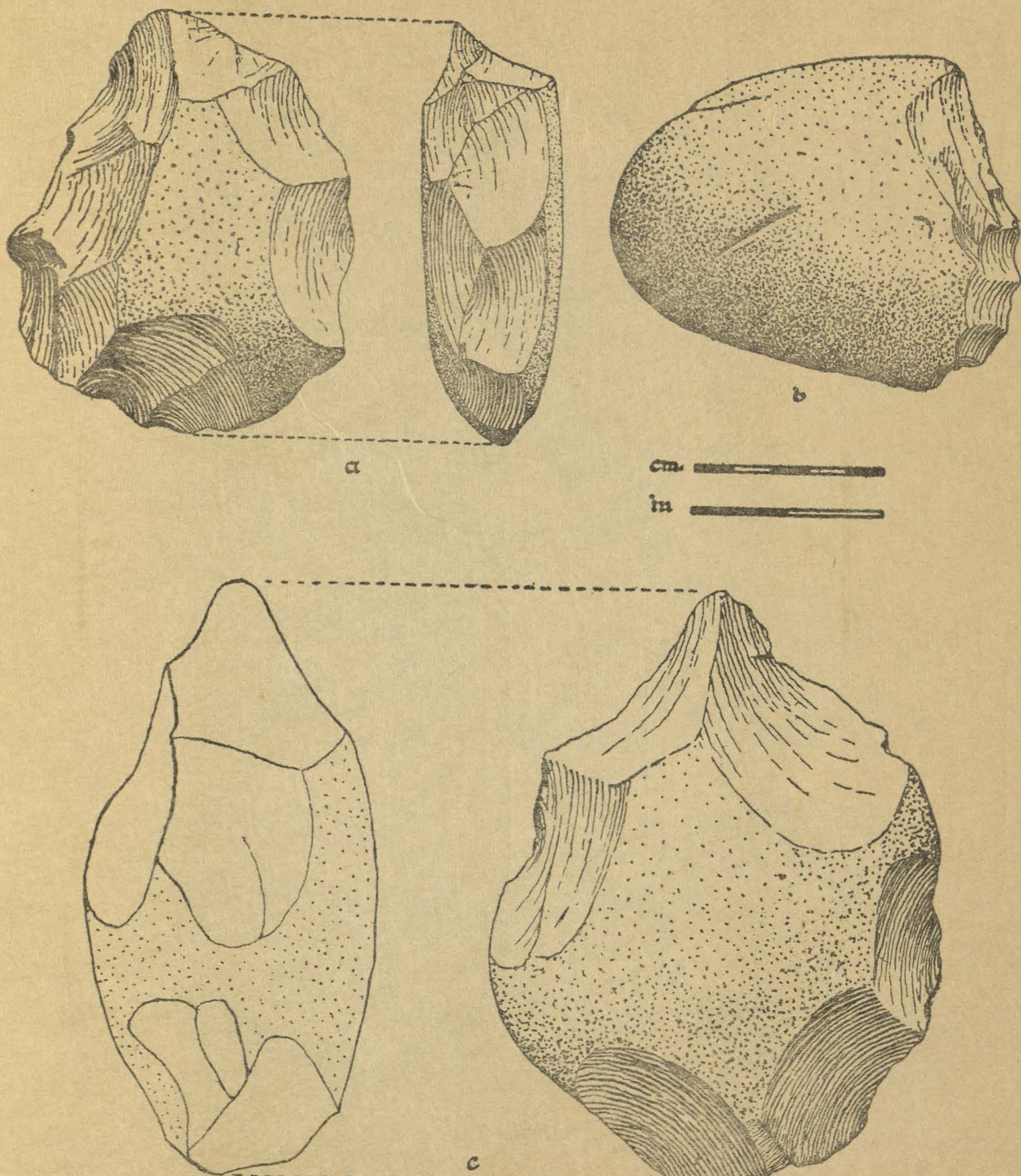


The Lower Soan

Figure 31

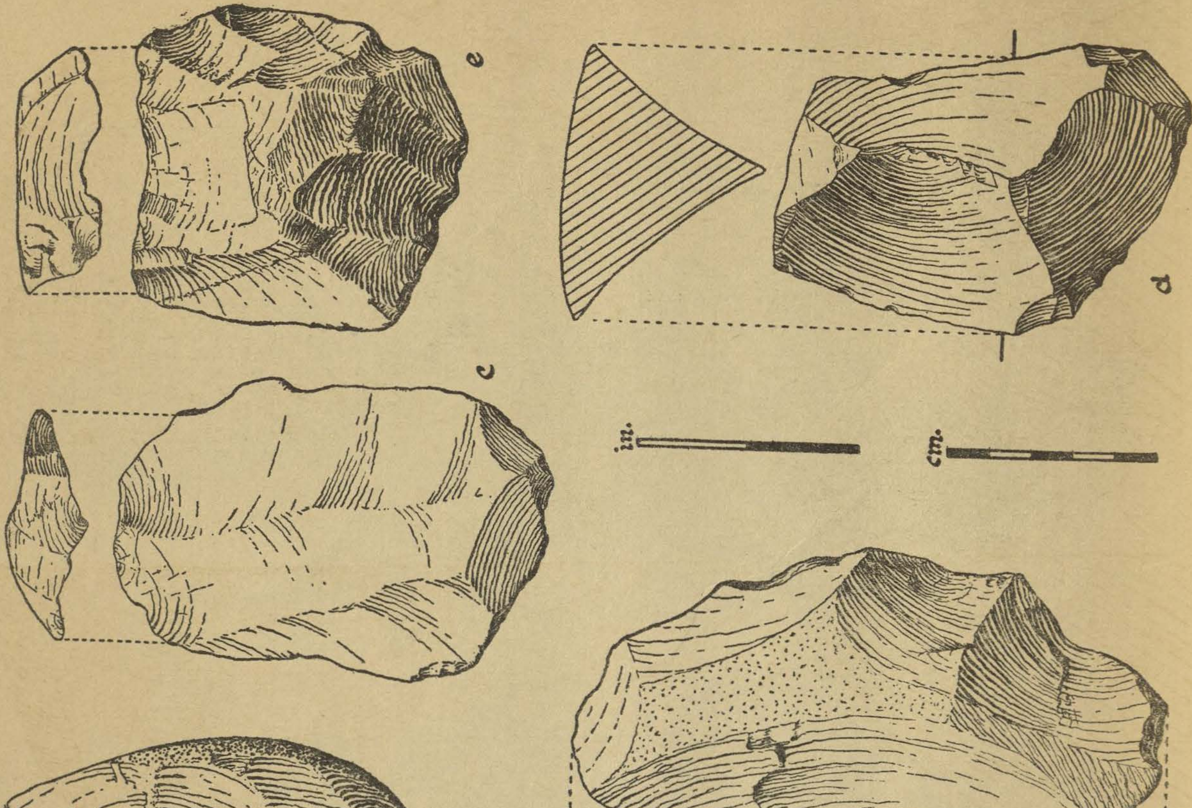


The Middle Soan A



The Middle Soan A

Figure 23



The Middle Soan A

Figure 24

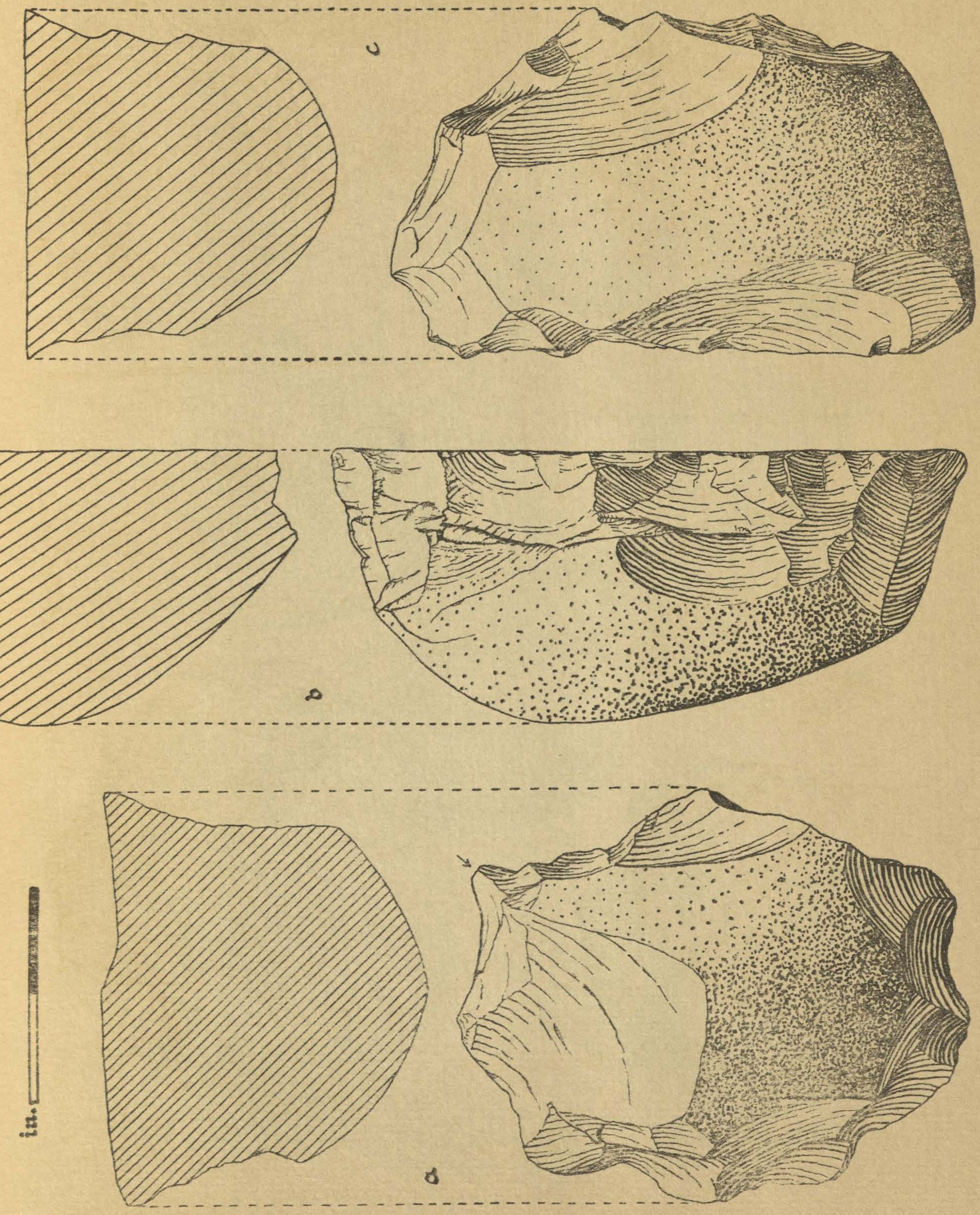
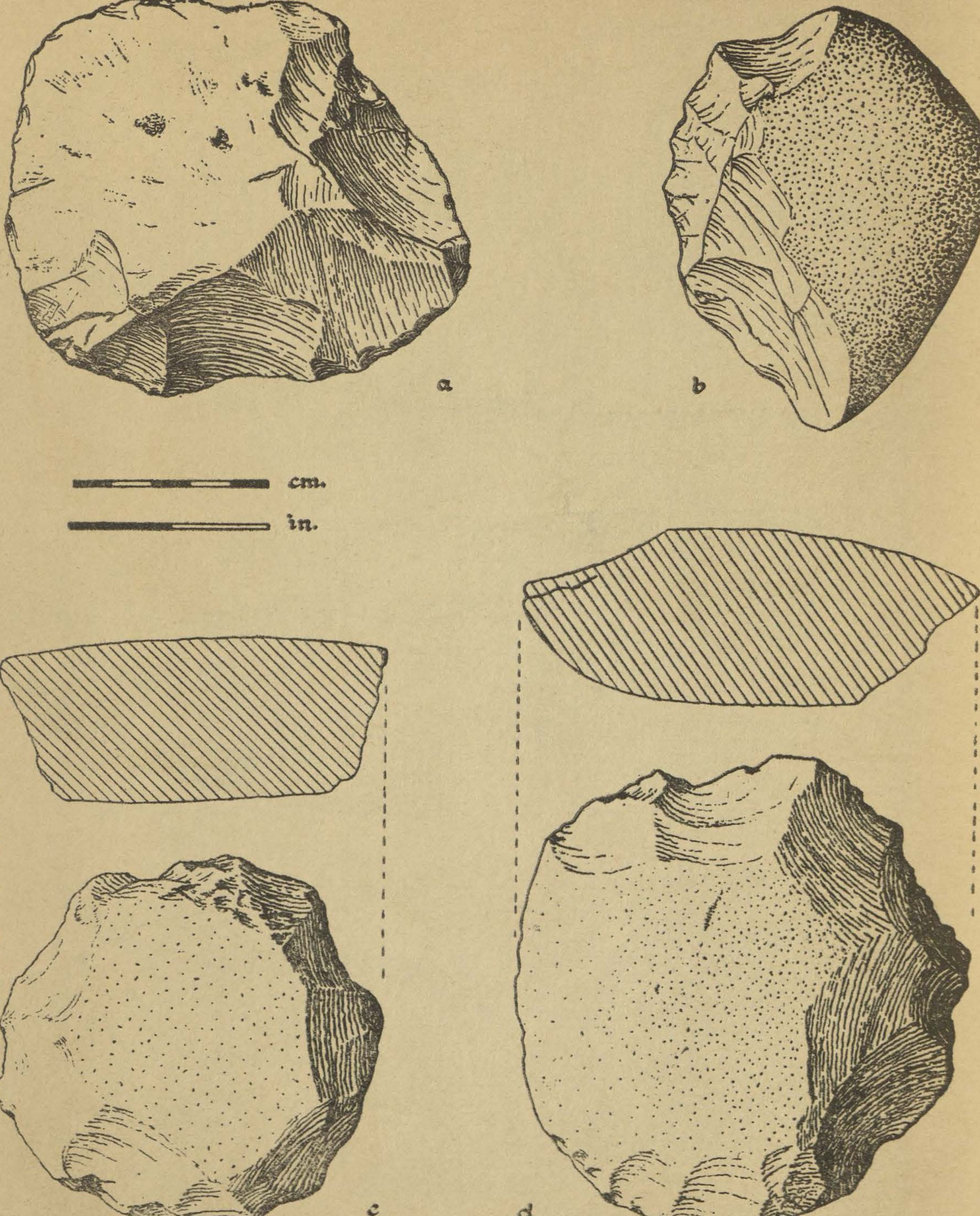
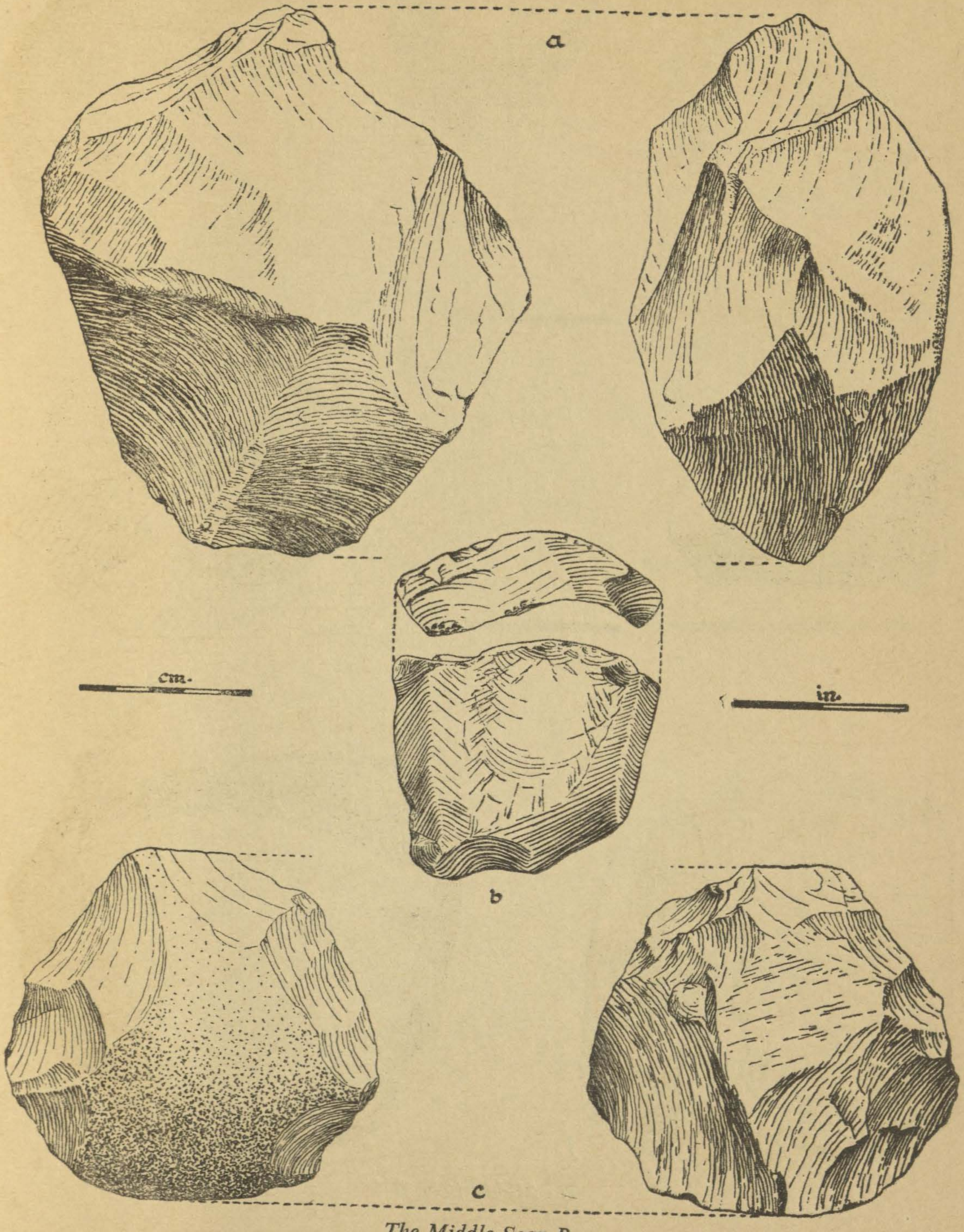


Figure 25



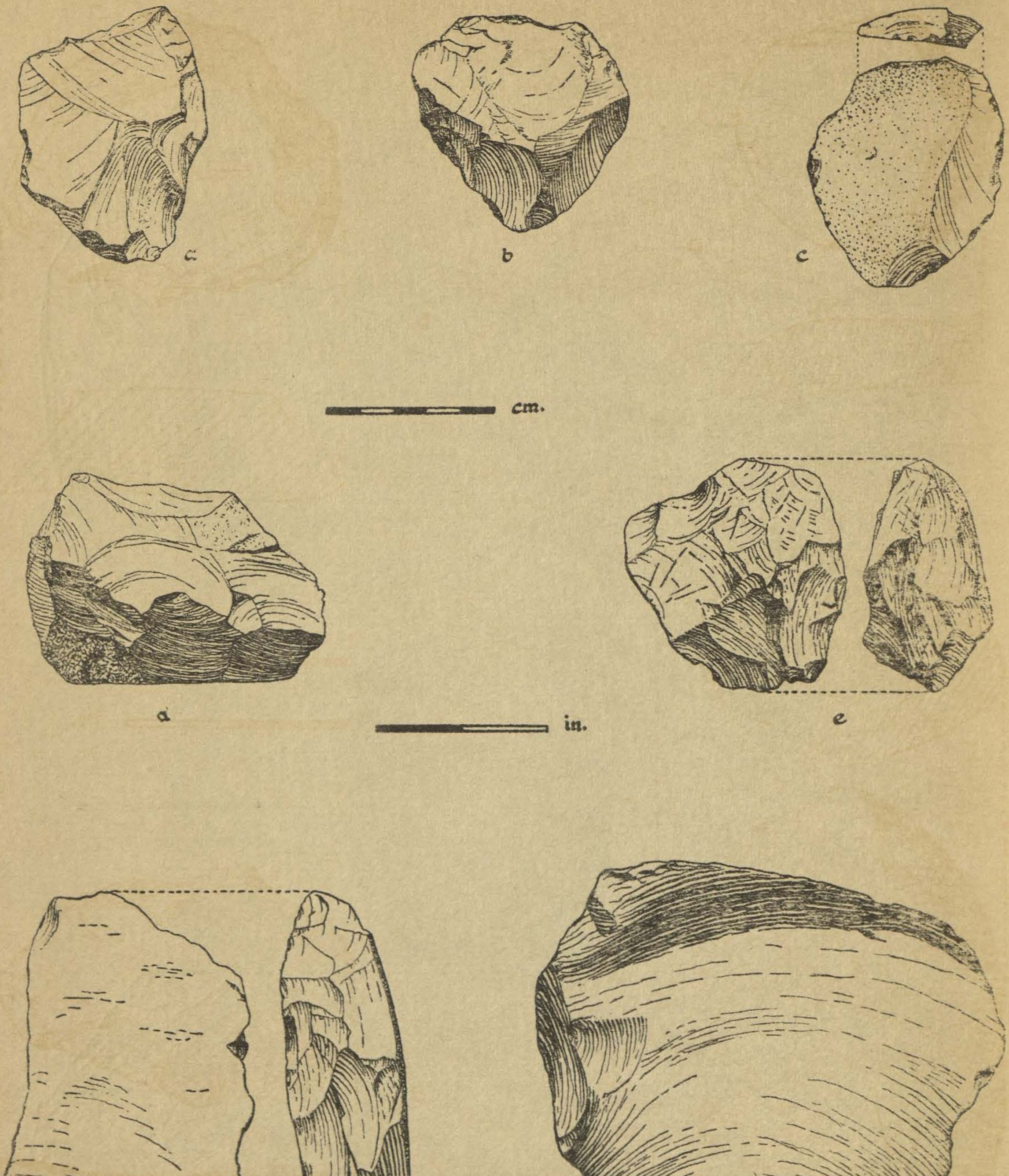
The Middle Soan B

Figure 26



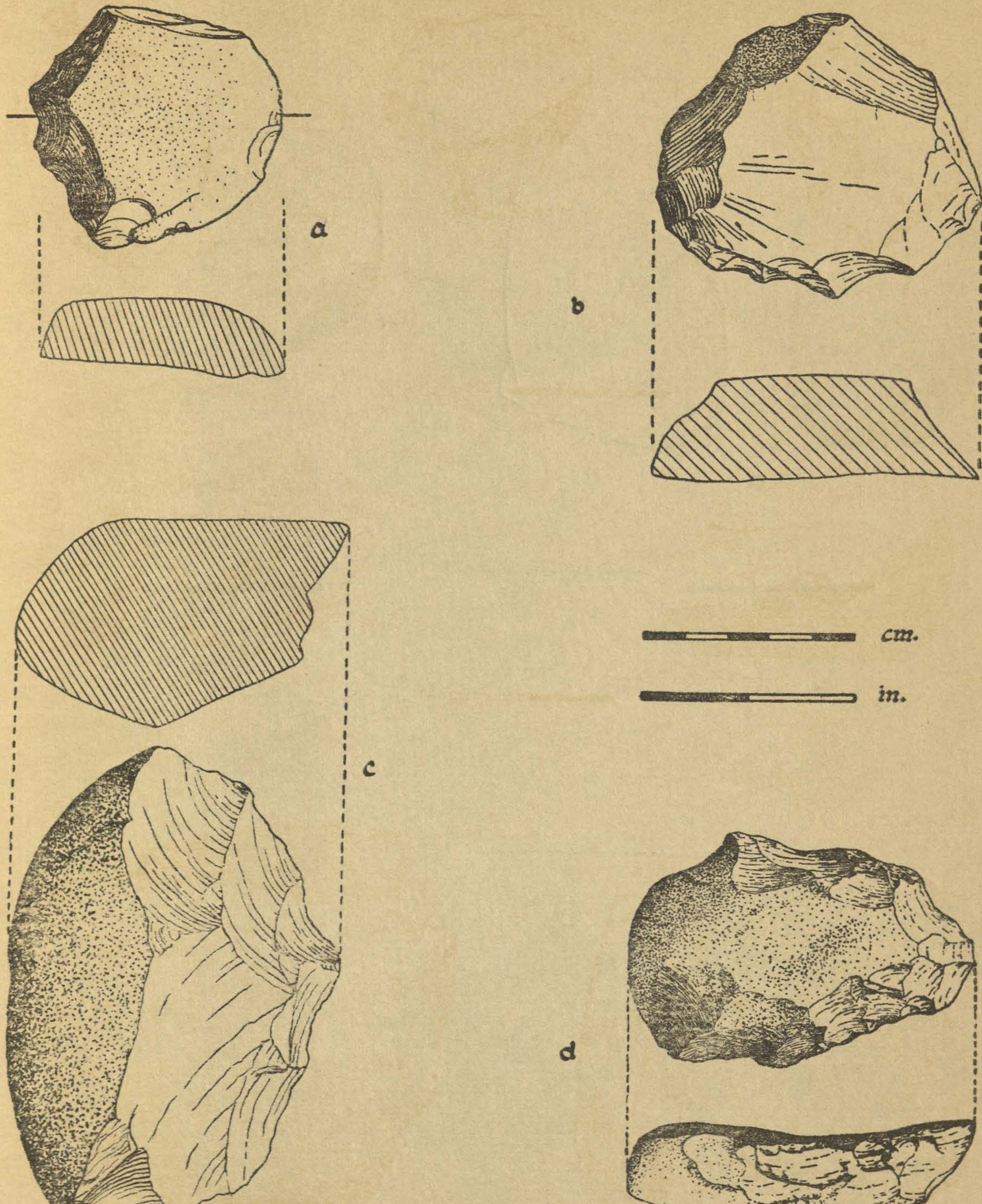
The Middle Soan B

Figure 27



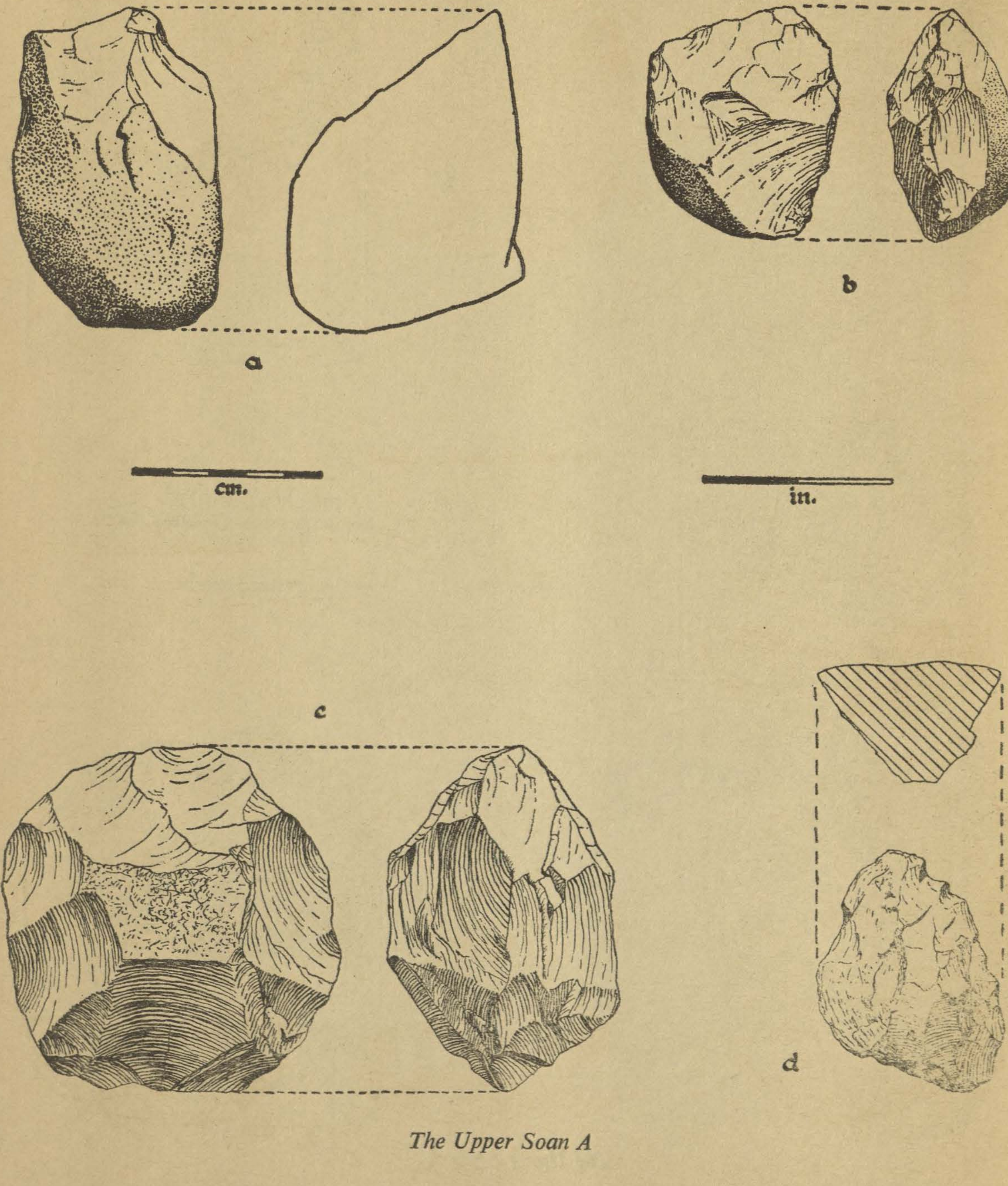
The Middle Soan B

Figure 28



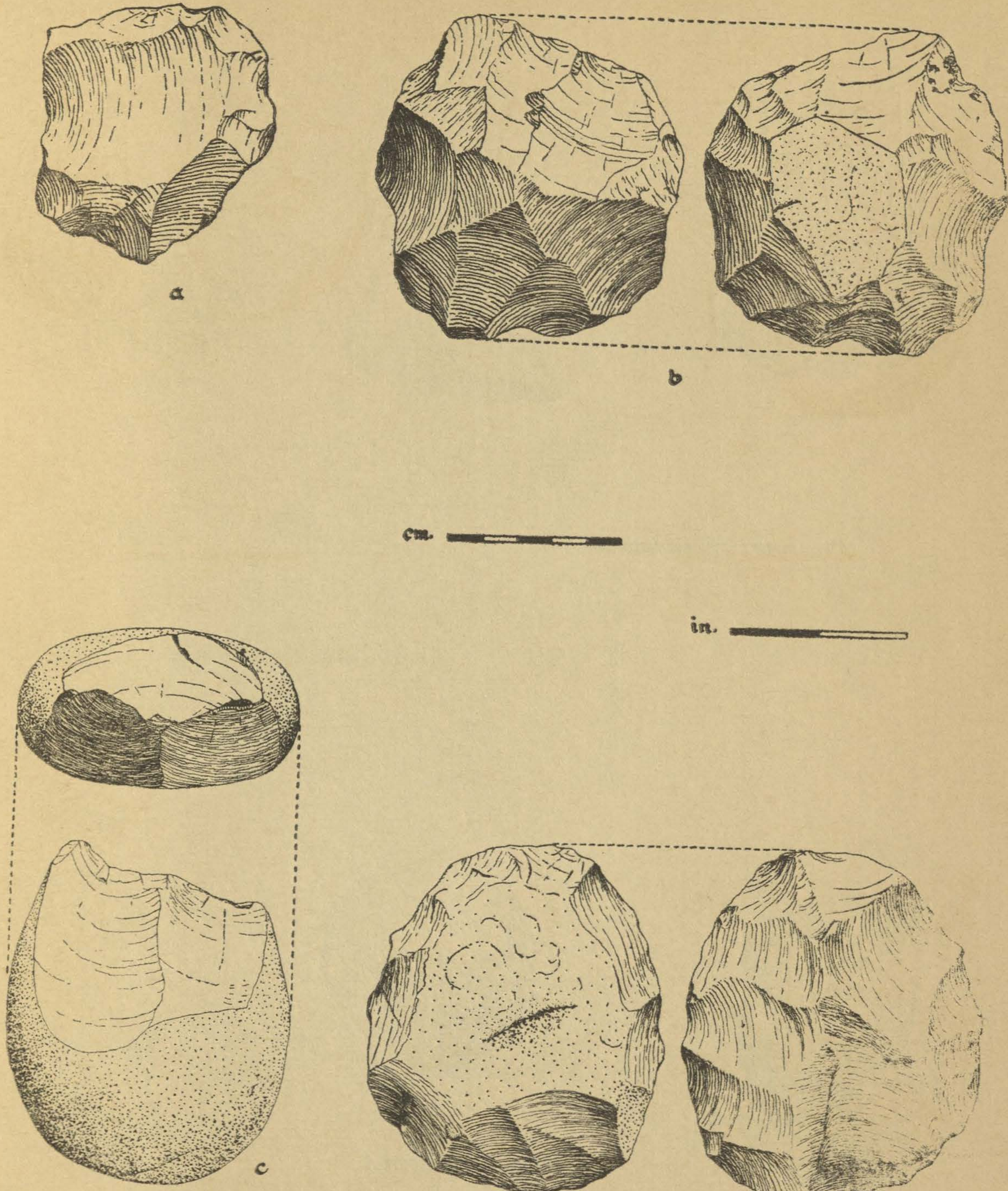
The Upper Soan A

Figure 29



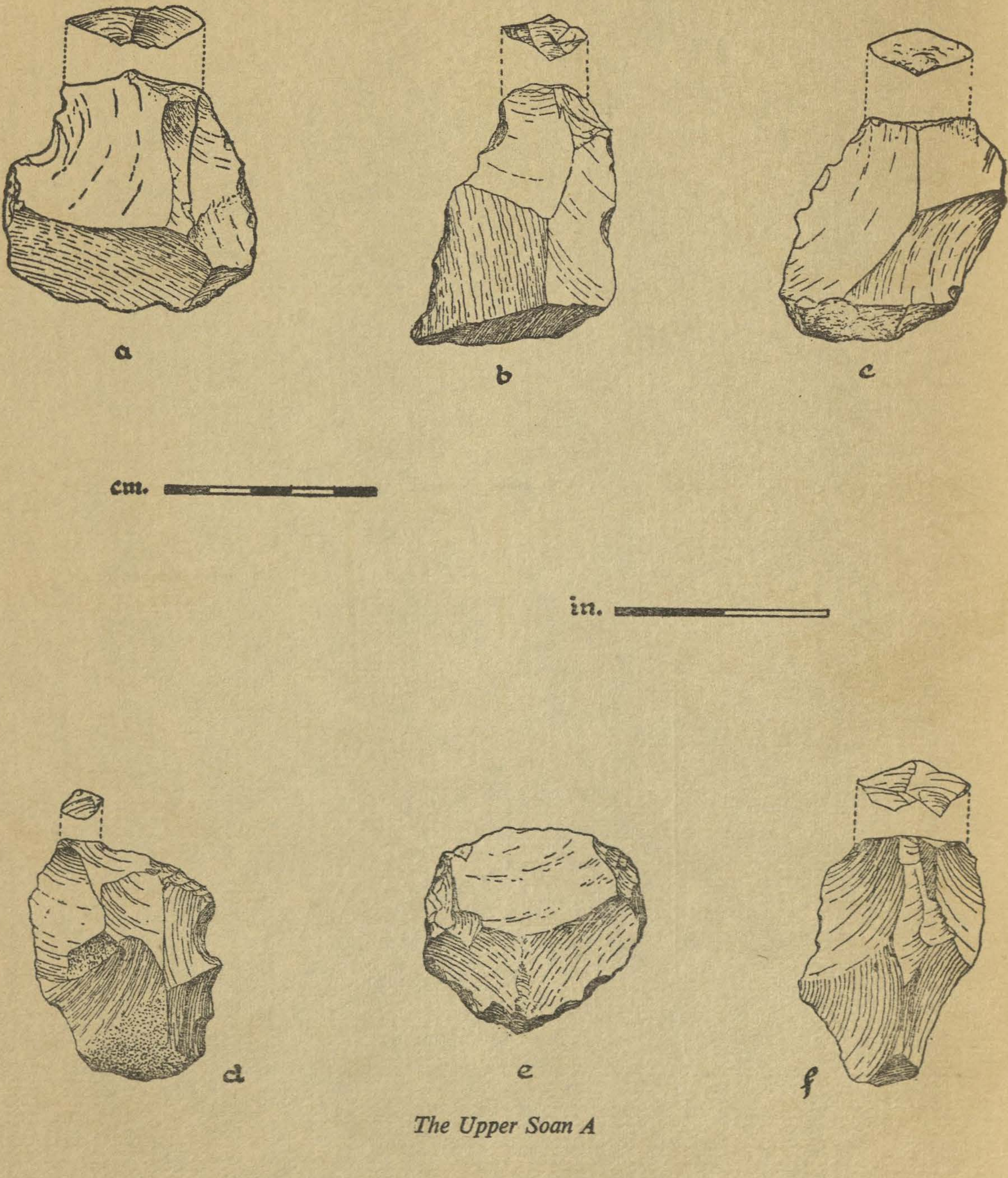
The Upper Soan A

Figure 30



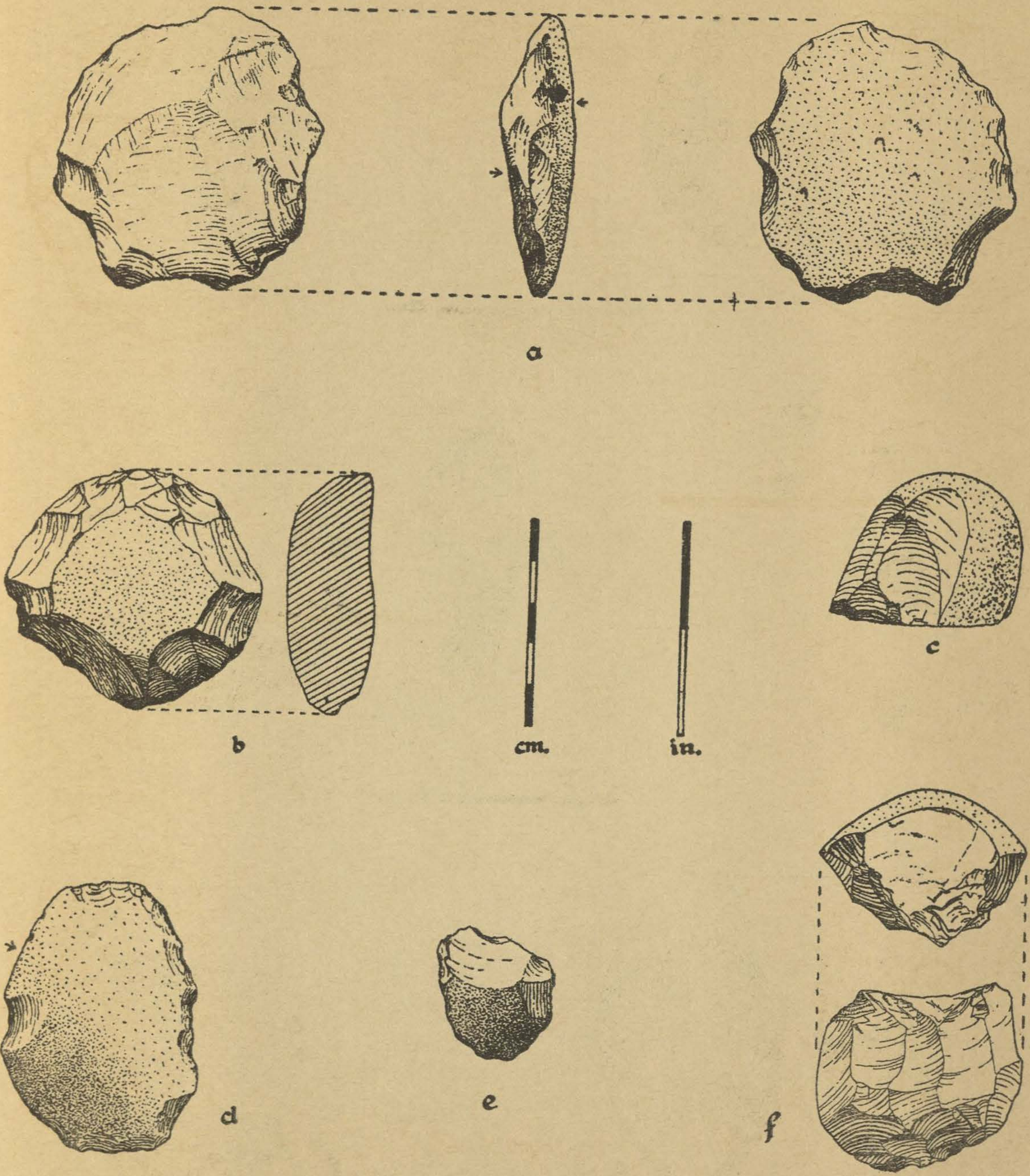
The Upper Soan A

Figure 31



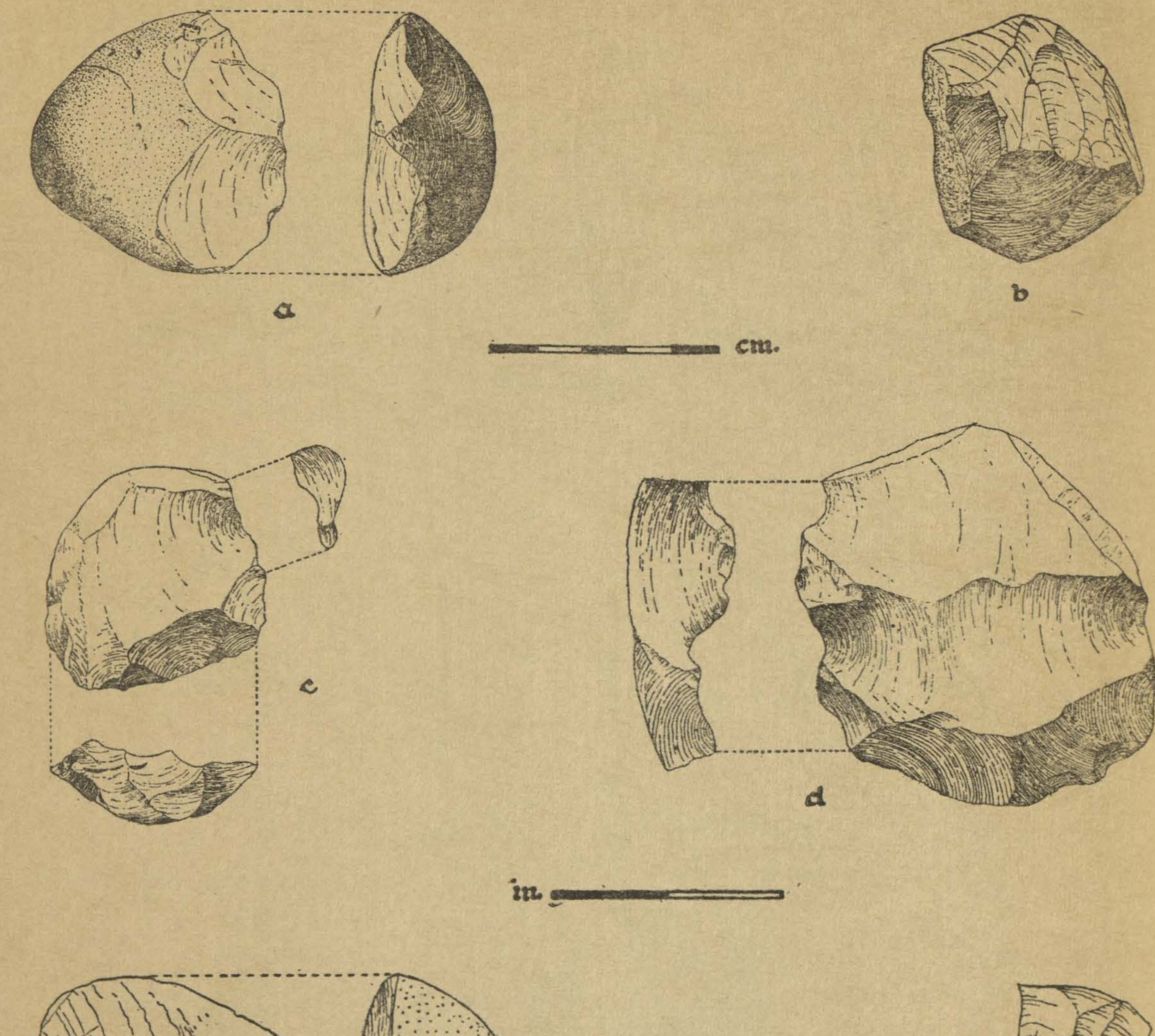
The Upper Soan A

Figure 32



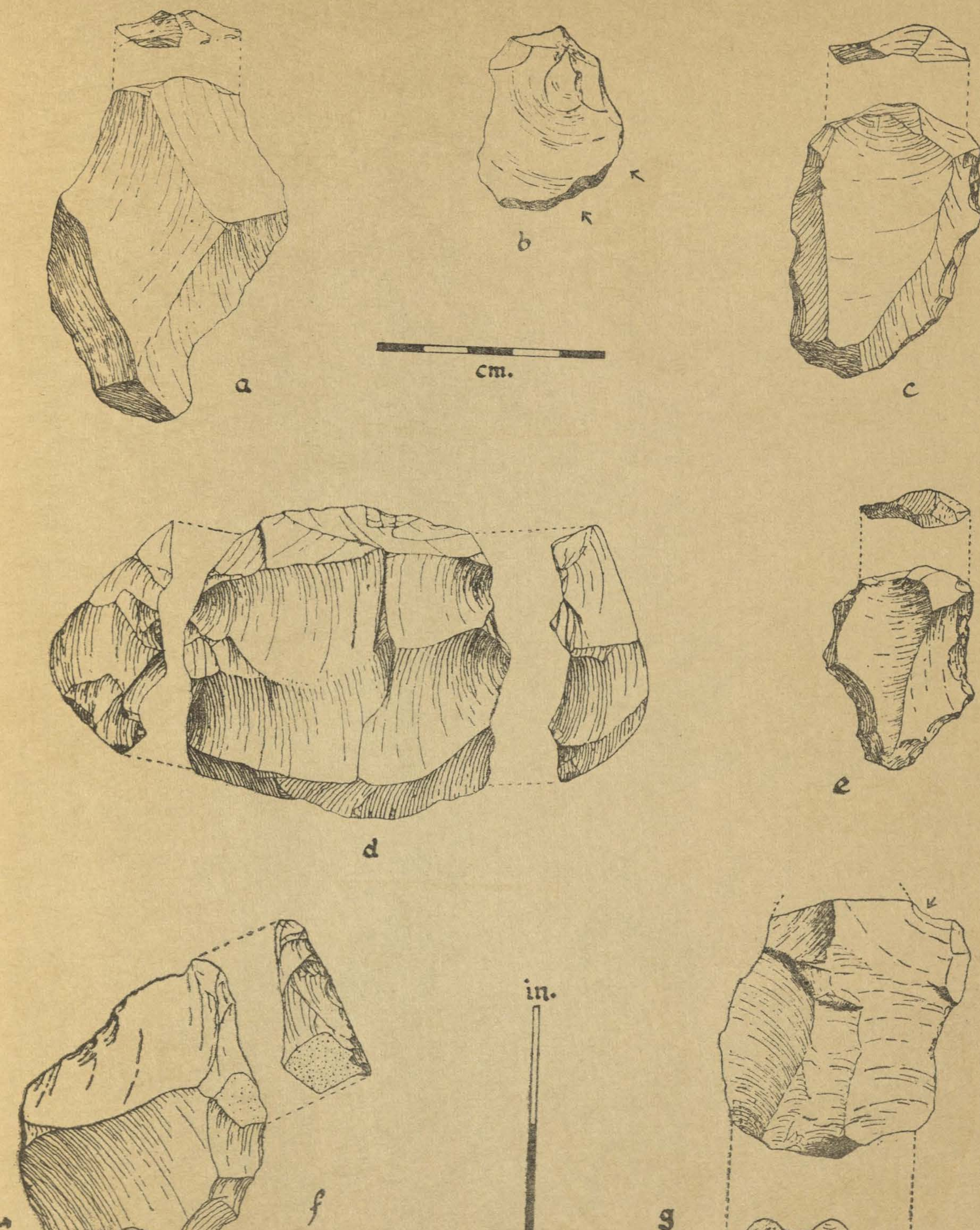
The Upper Soan B

Figure 33



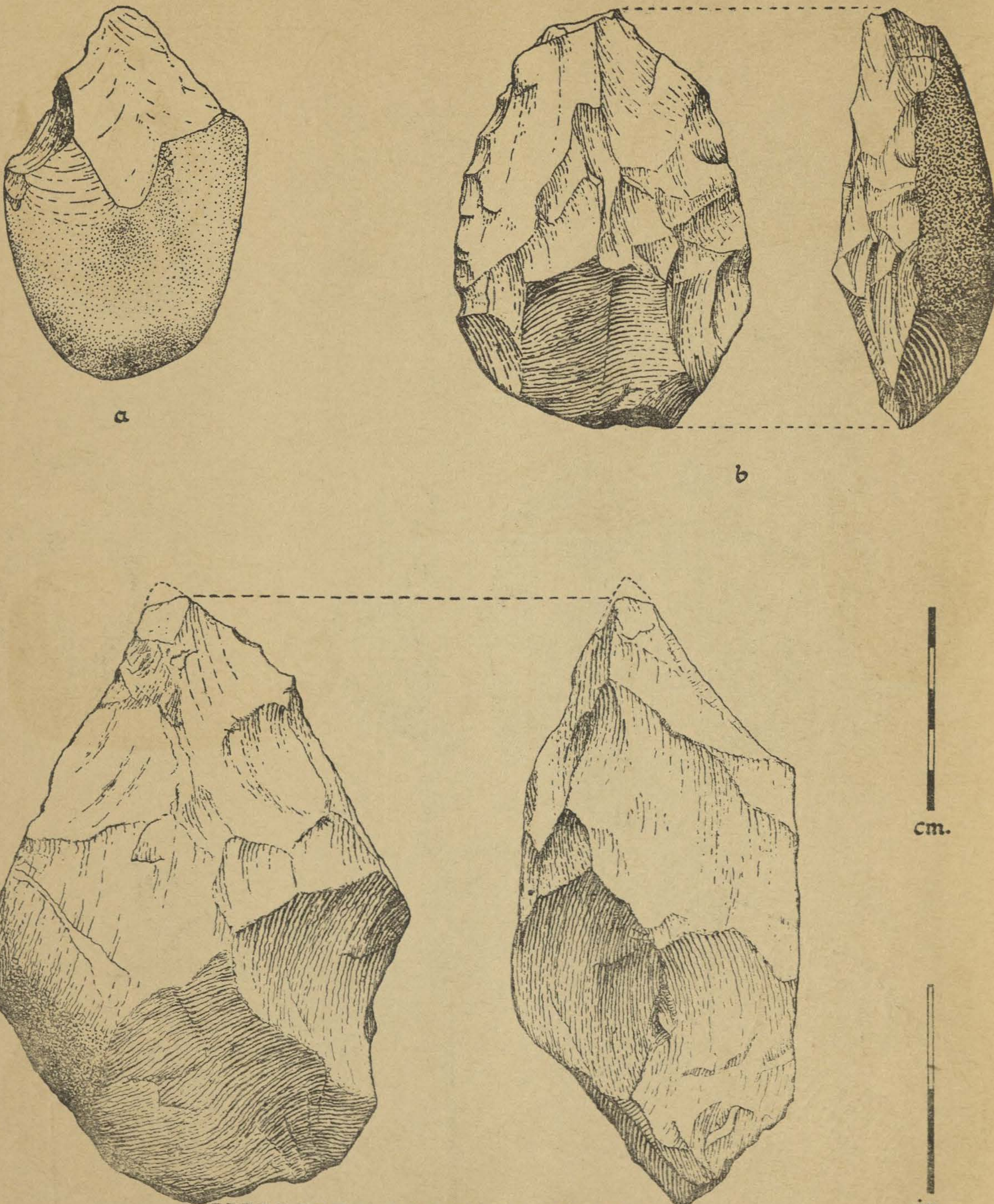
The Upper Soan B

Figure 34



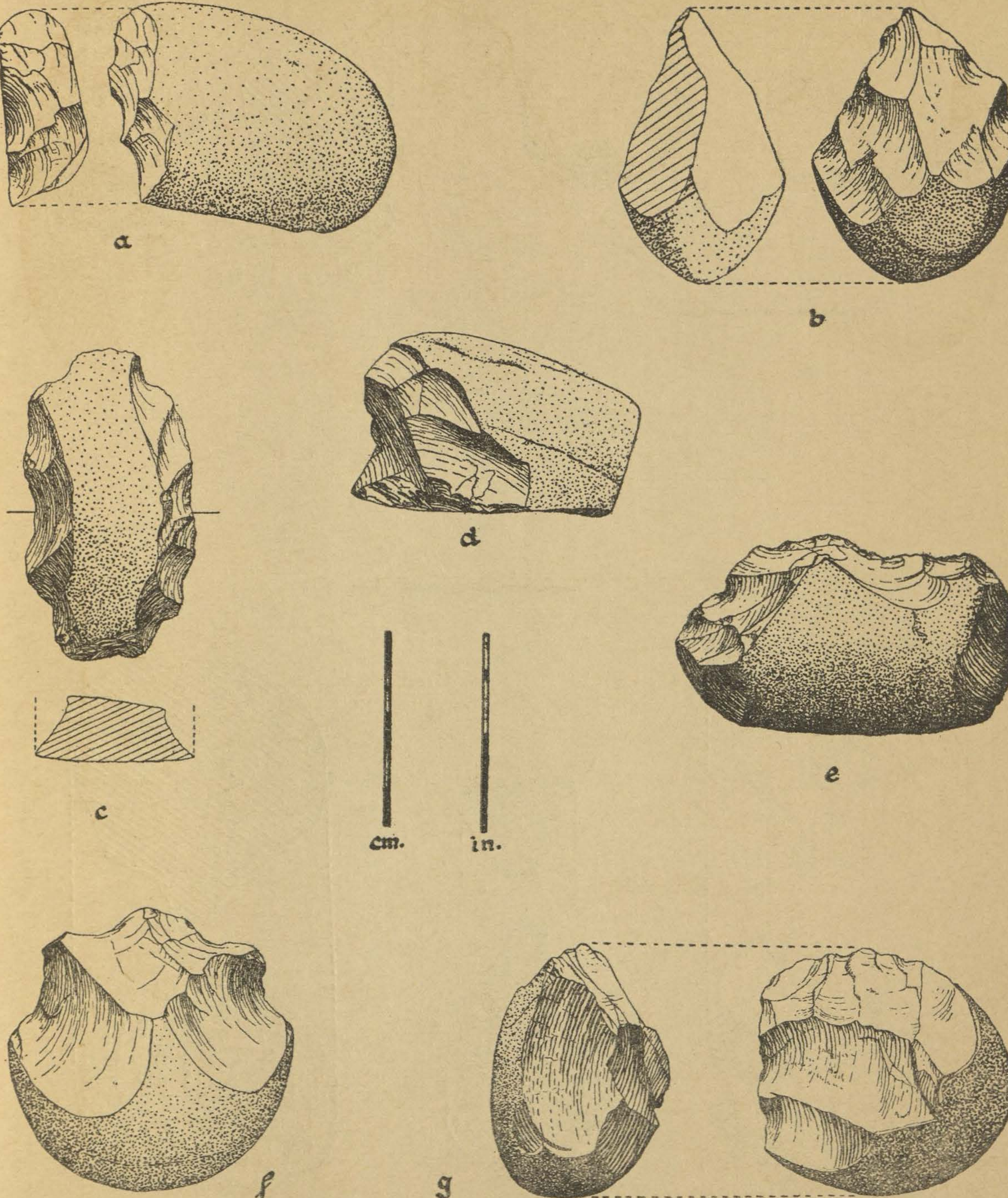
The Upper Soan B

Figure 35



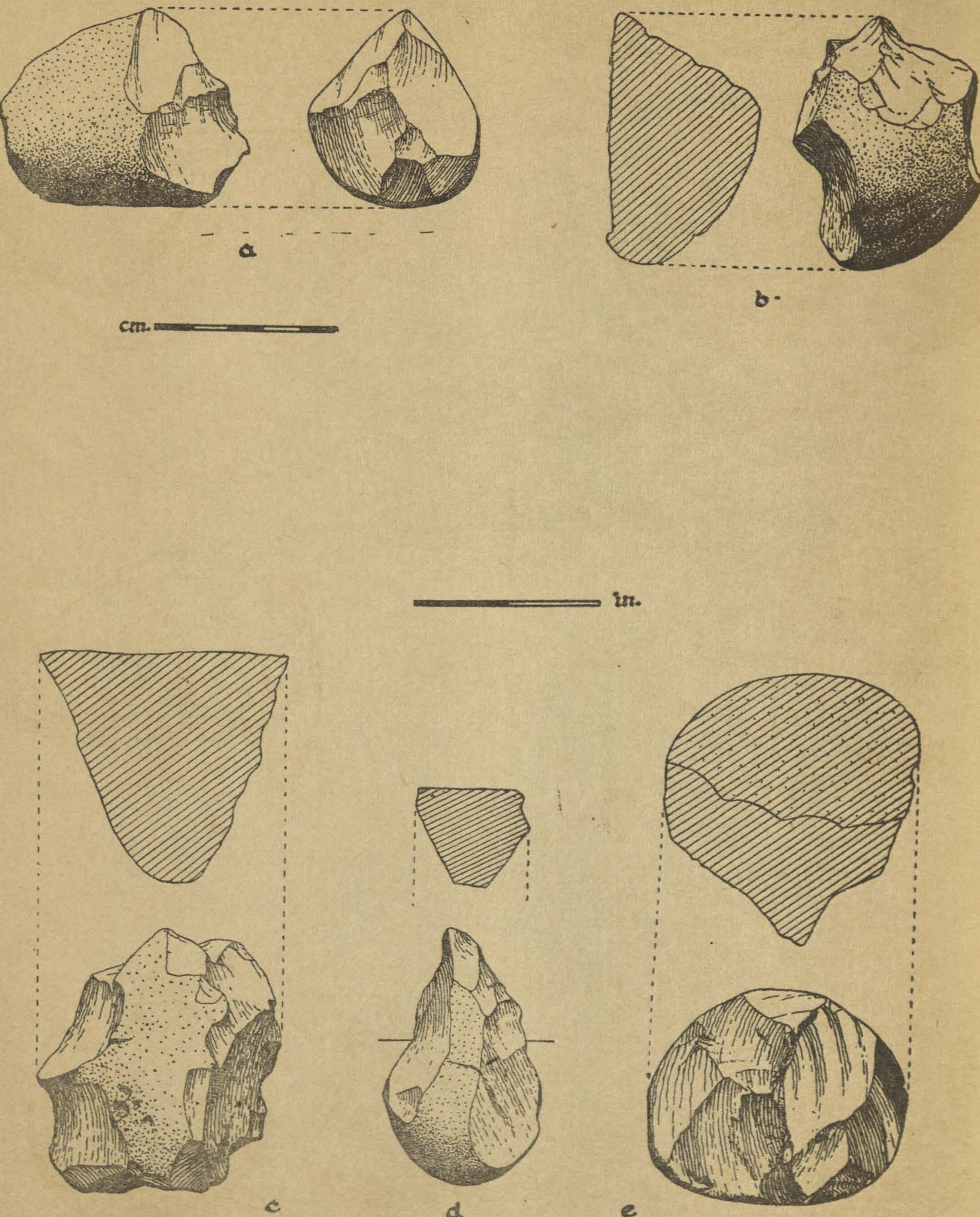
The Upper Soan B

Figure 36



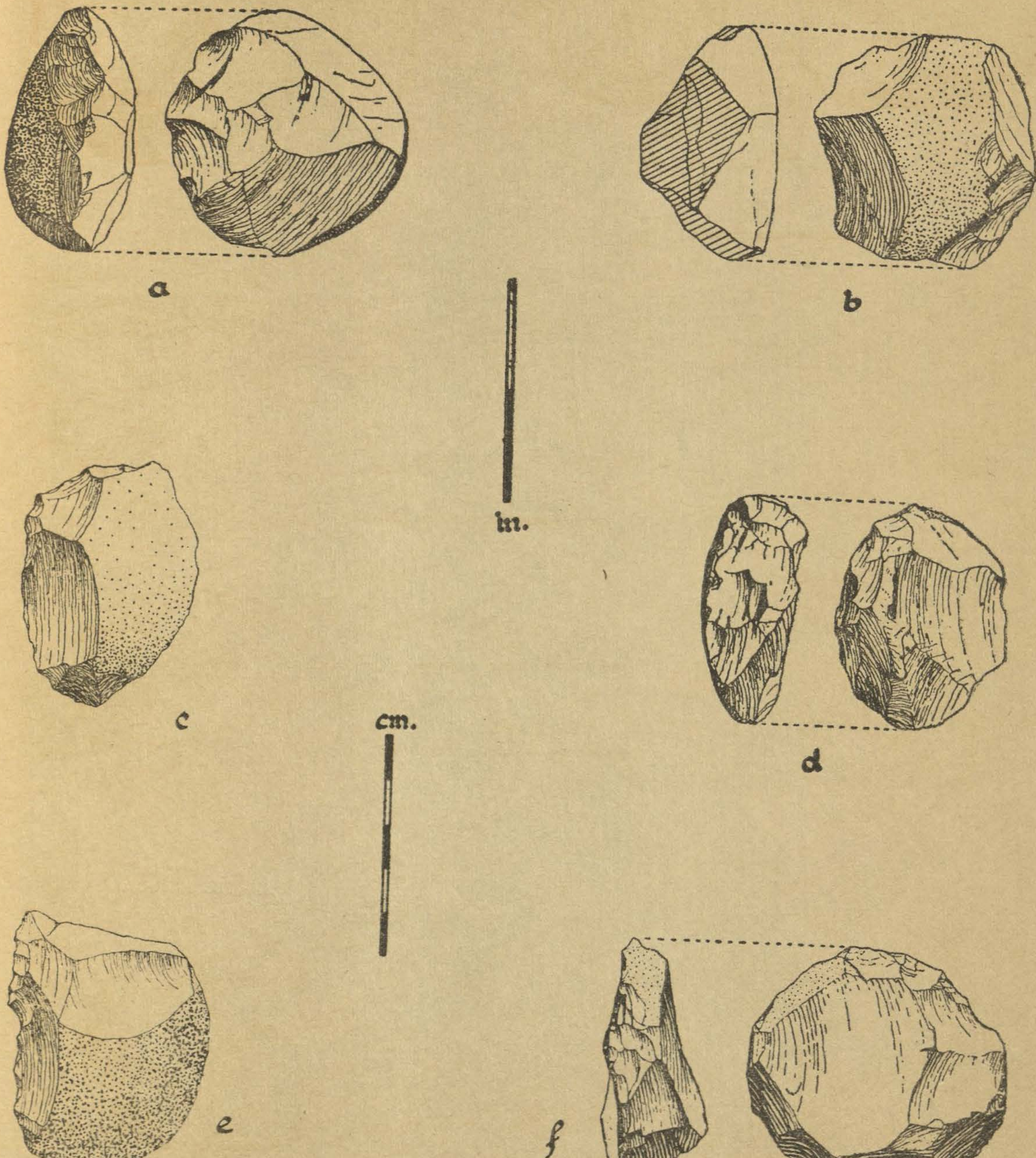
The Final Soan

Figure 37



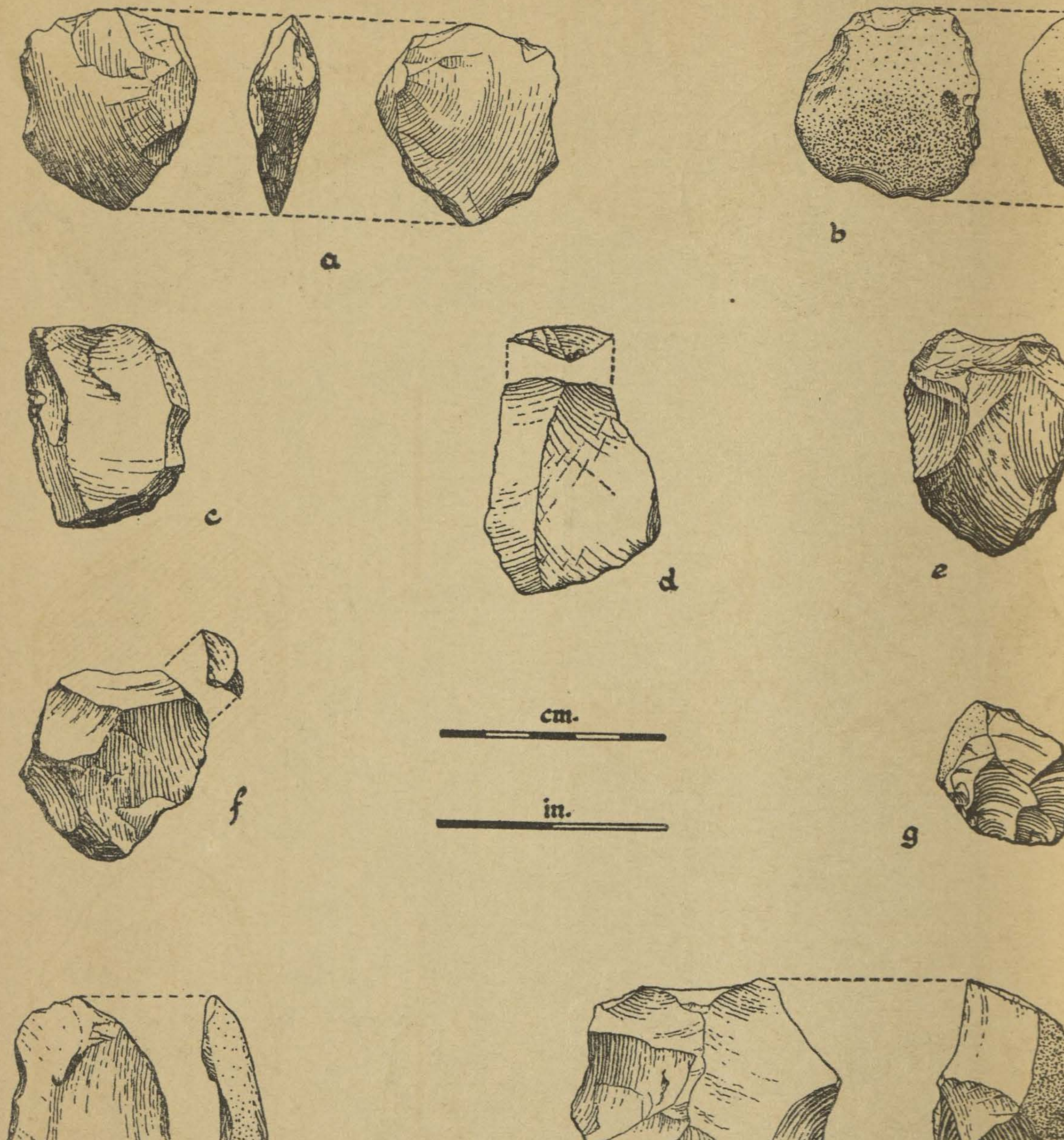
The Final Soan

Figure 38



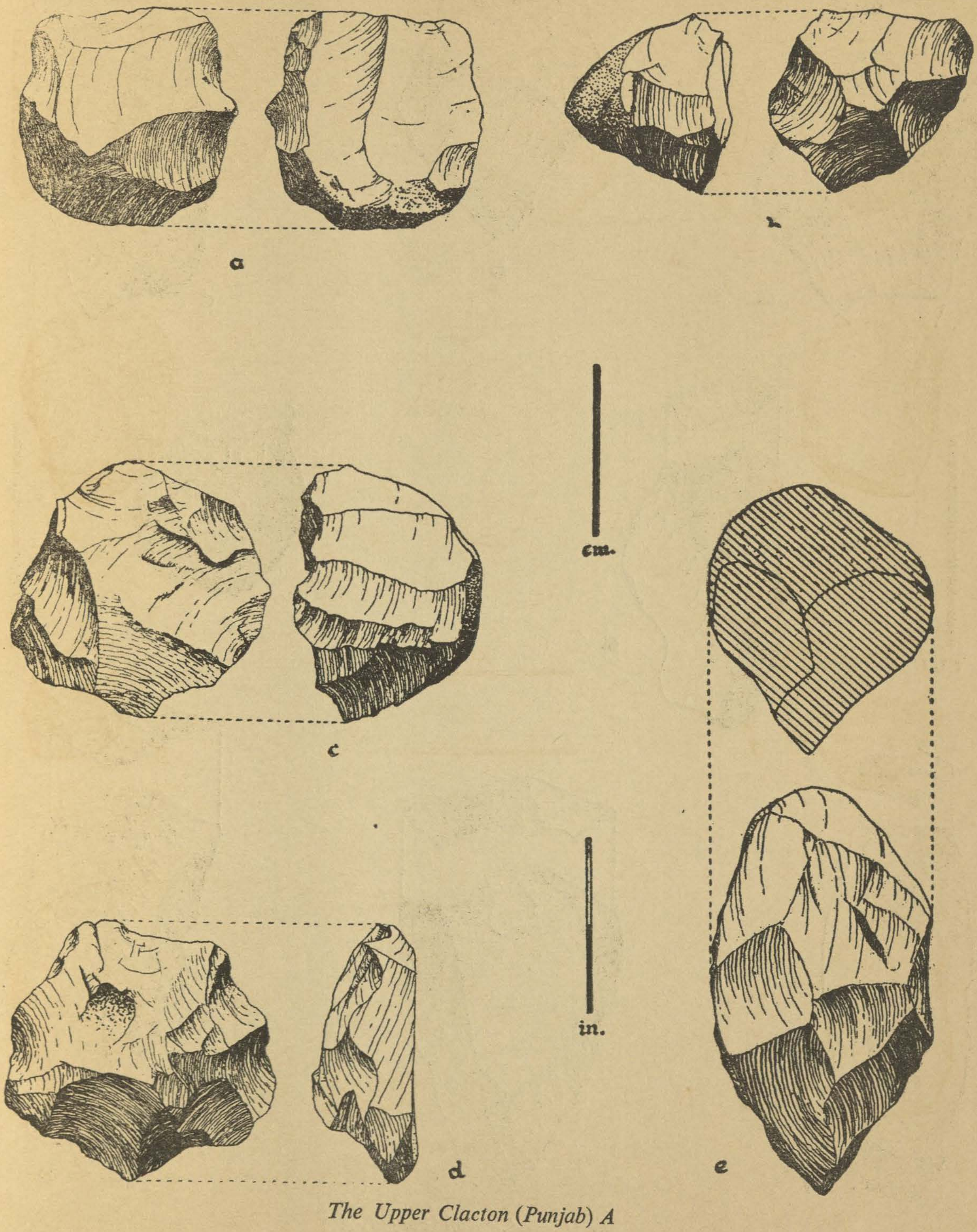
The Final Soan

Figure 39



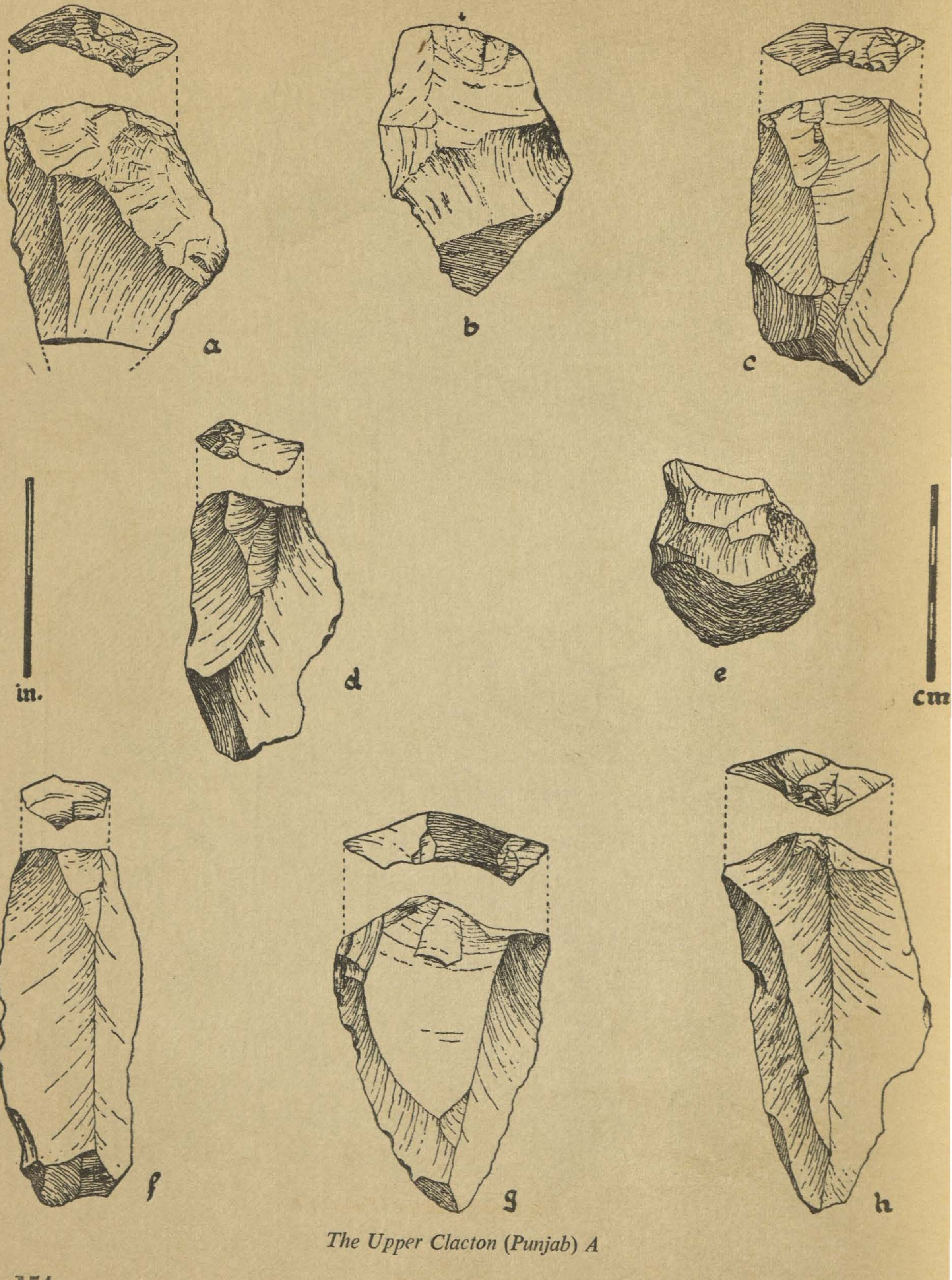
The Final Soan

Figure 40



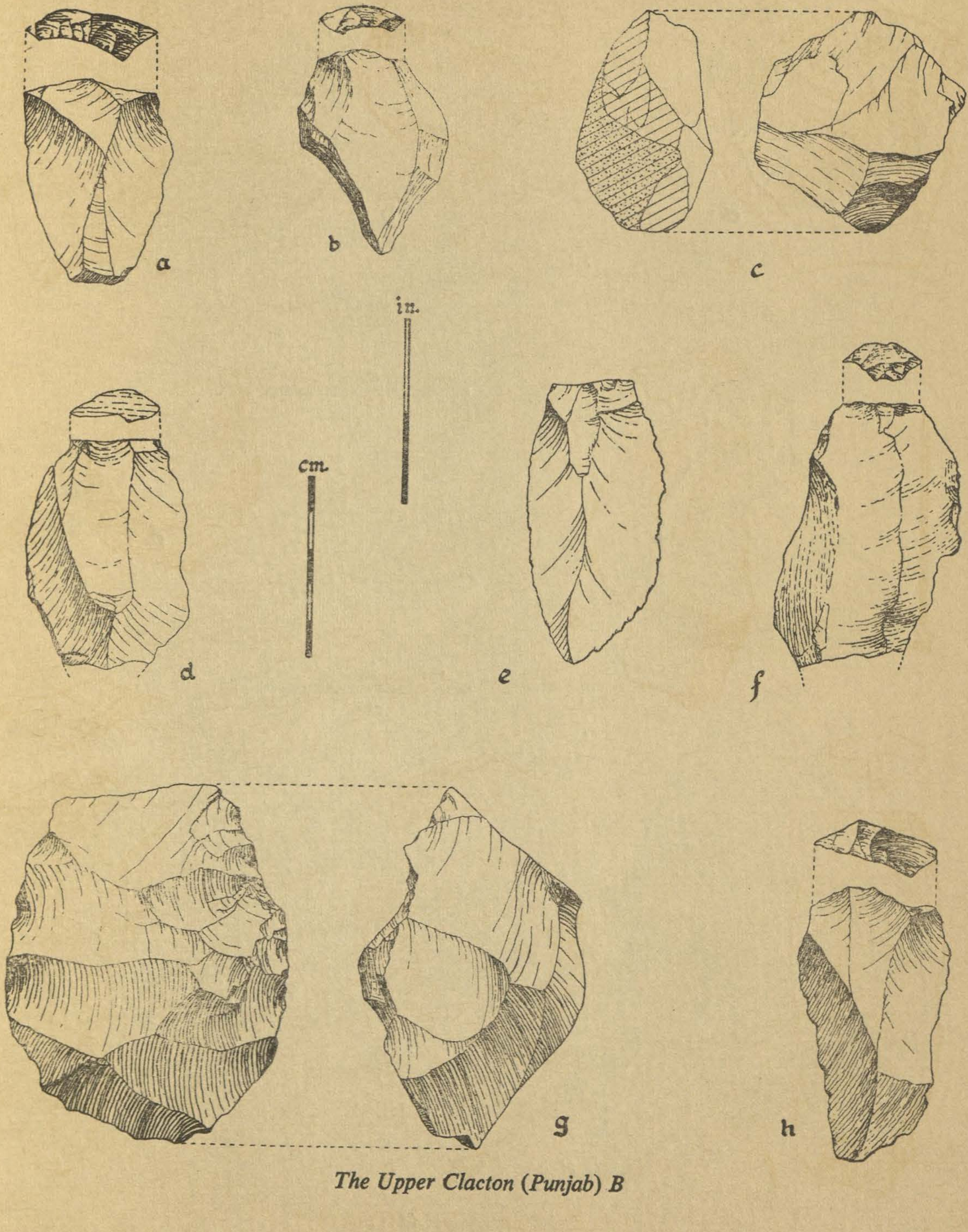
The Upper Clacton (Punjab) A

Figure 41



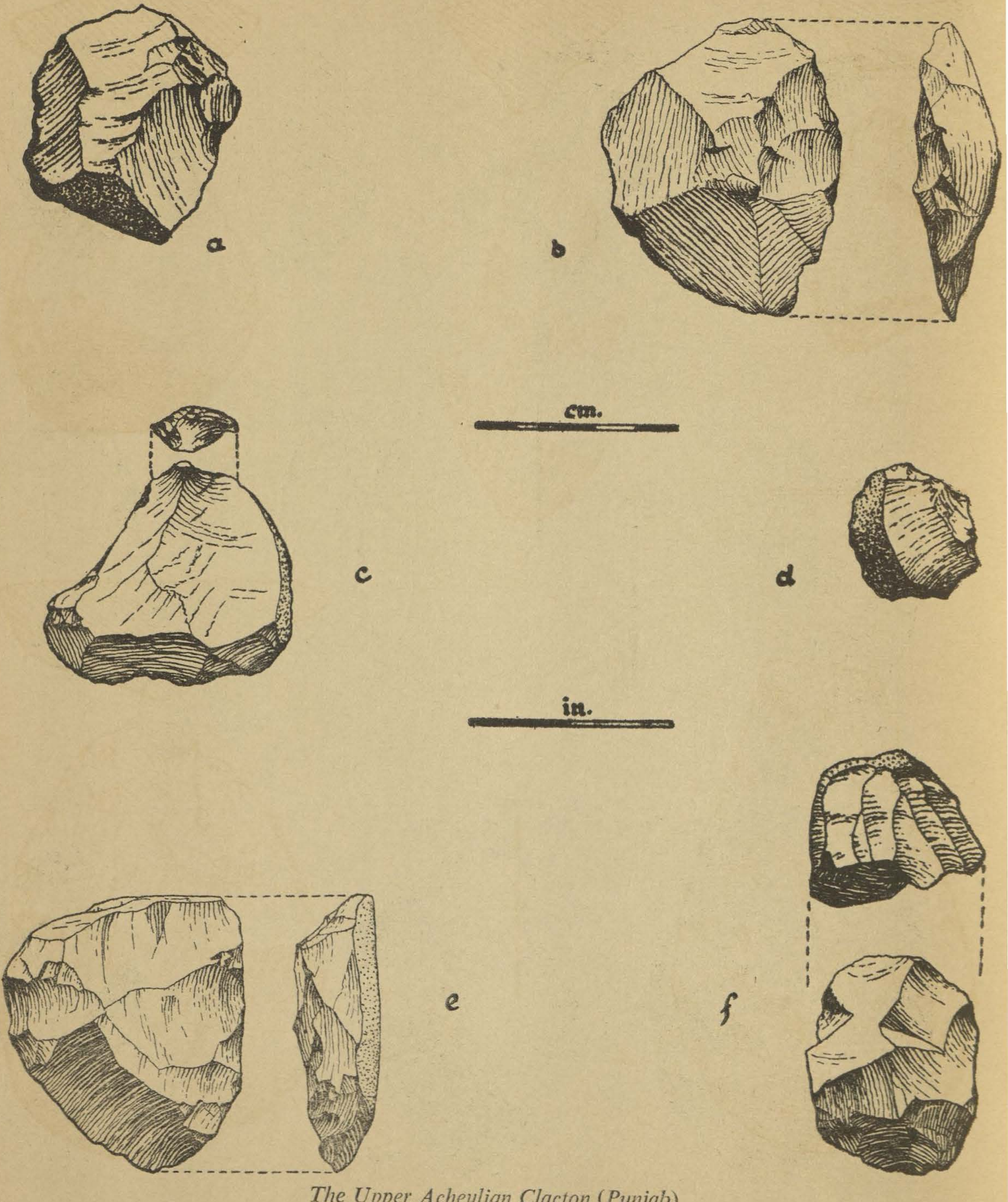
The Upper Clacton (Punjab) A

Figure 42



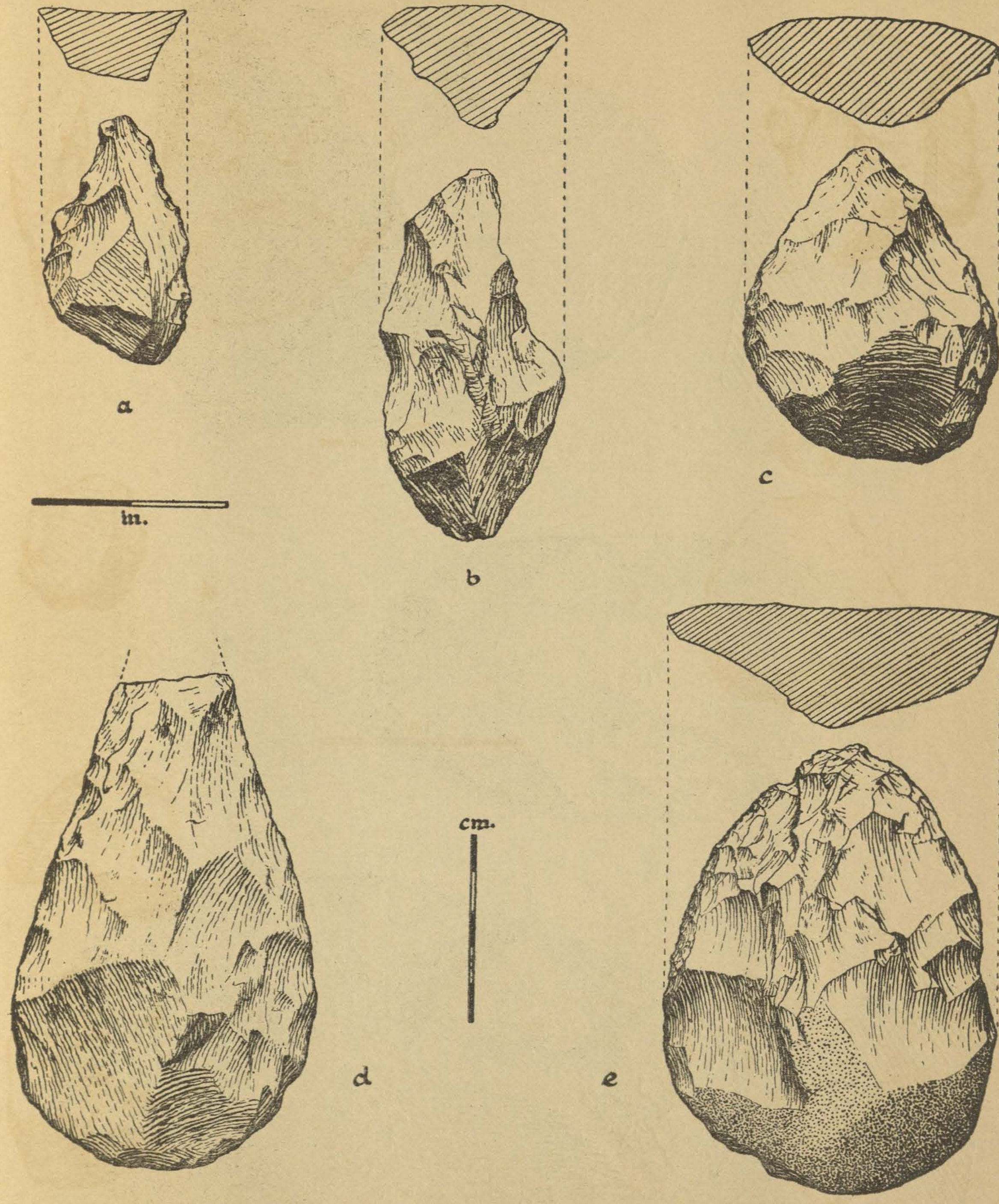
The Upper Clacton (Punjab) B

Figure 43



The Upper Acheulian Clacton (*Punjab*)

Figure 44



The Upper Acheulian Clacton (Punjab)

Figure 45

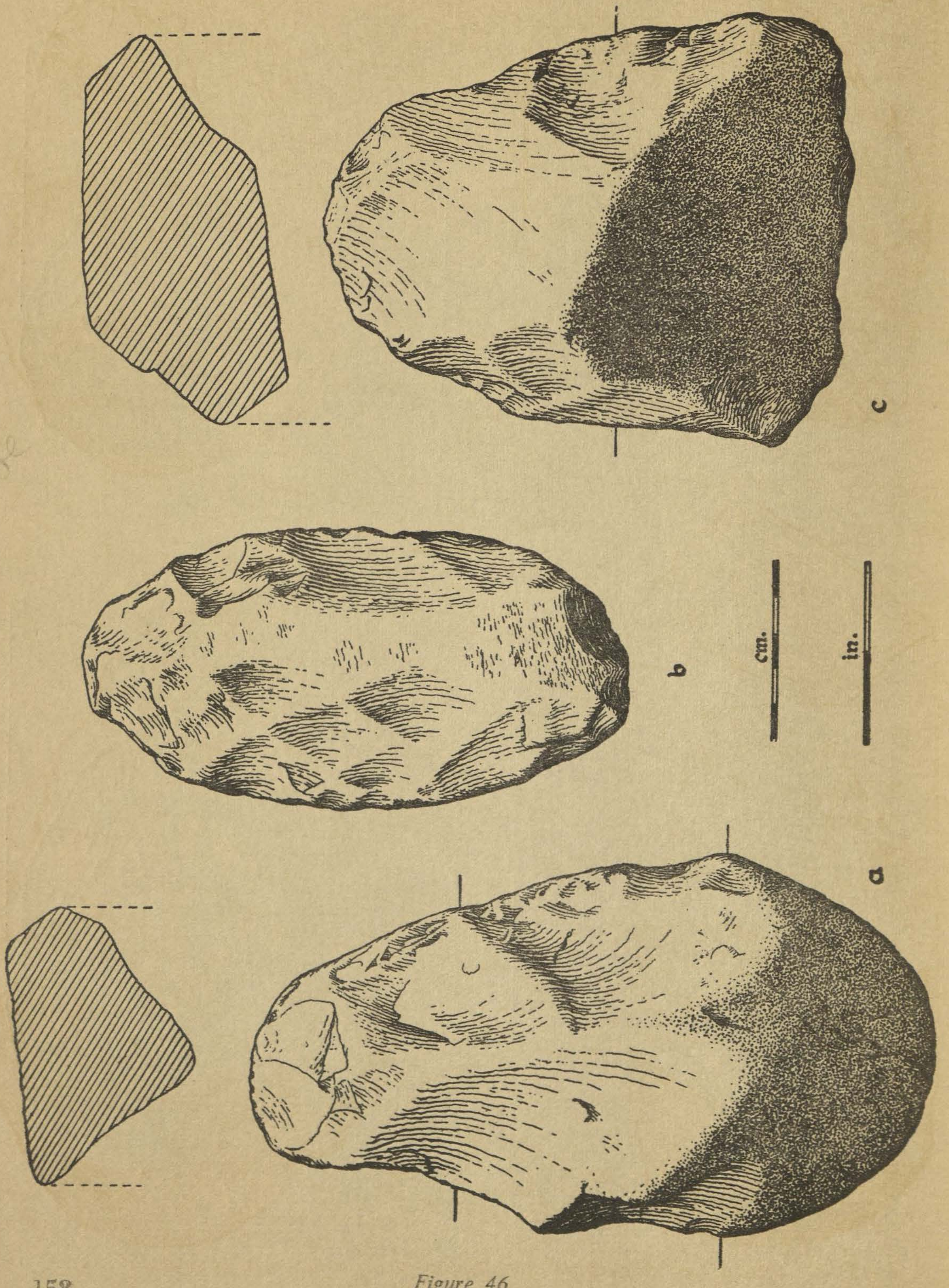
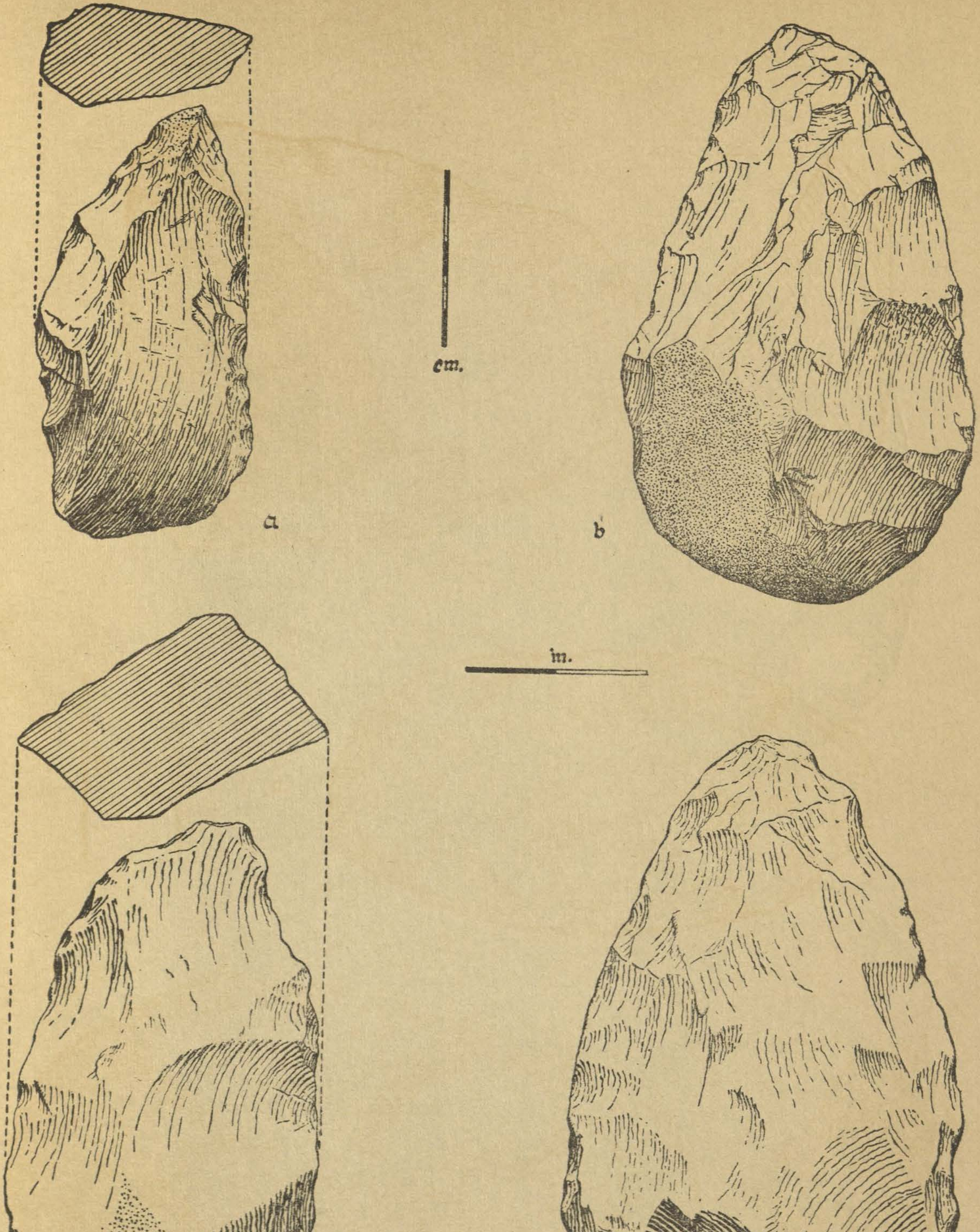


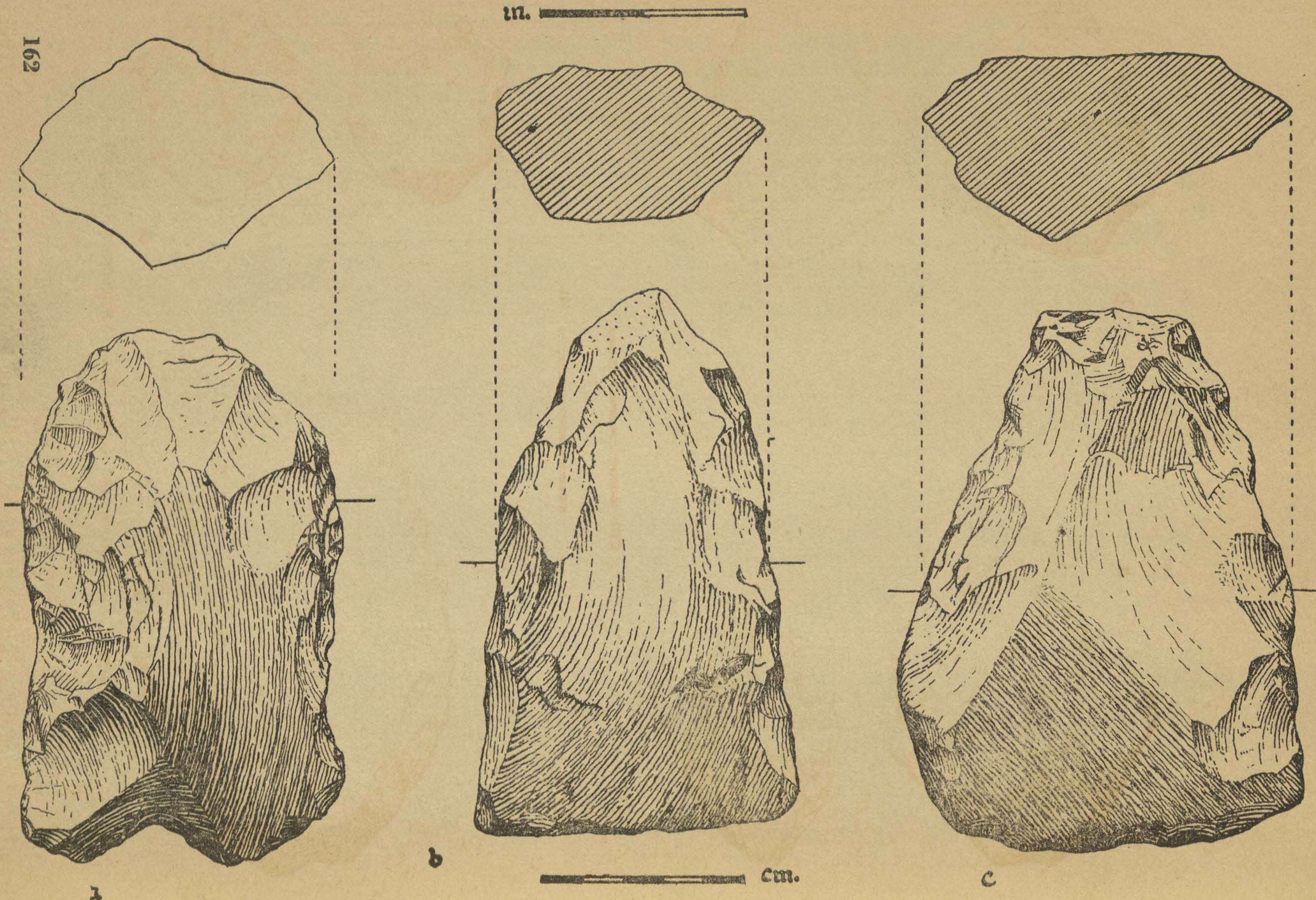
Figure 46

The Middle Stellenbosch

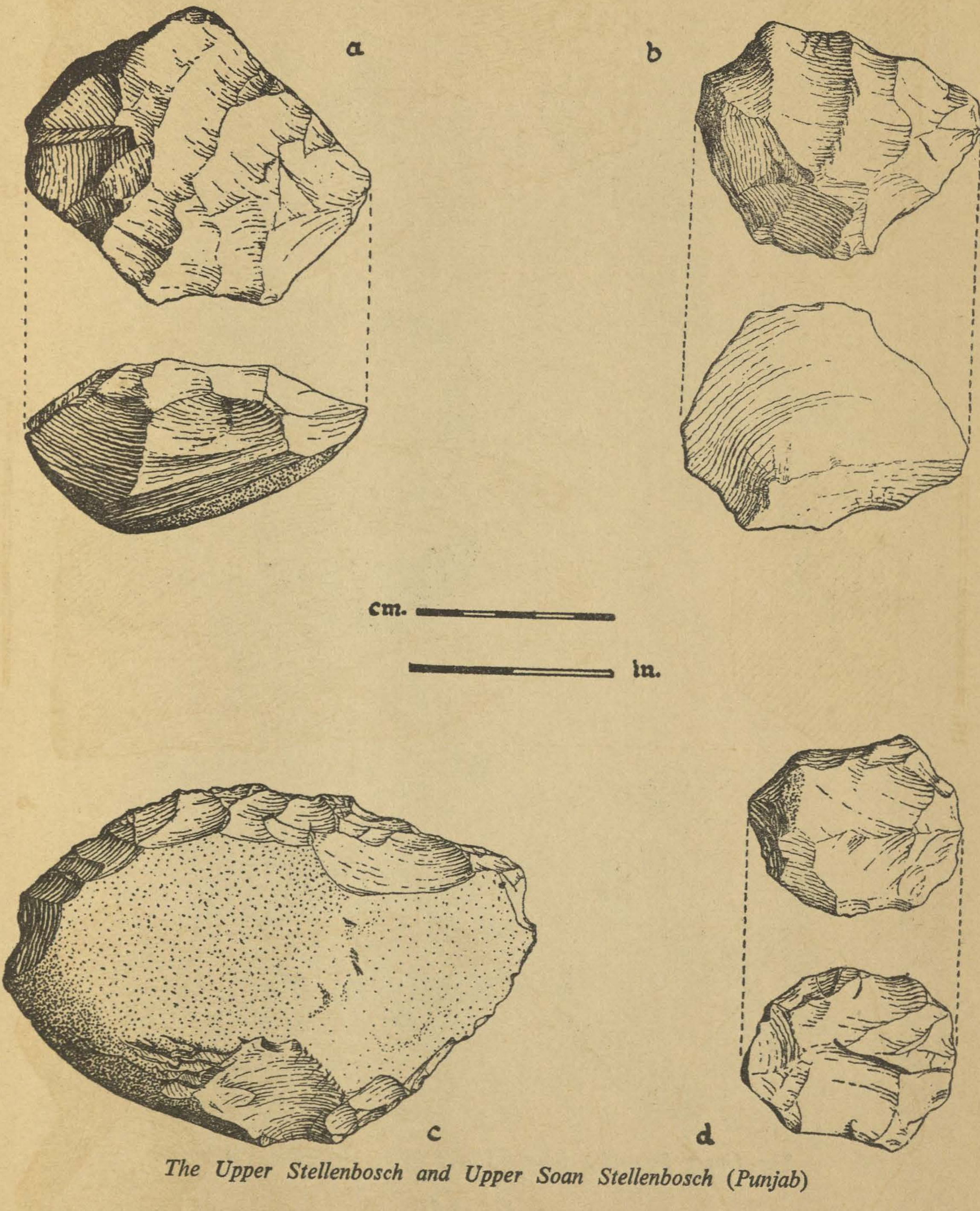


The Upper Stellenbosch and Upper Soan Stellenbosch (Punjab)

Figure 47

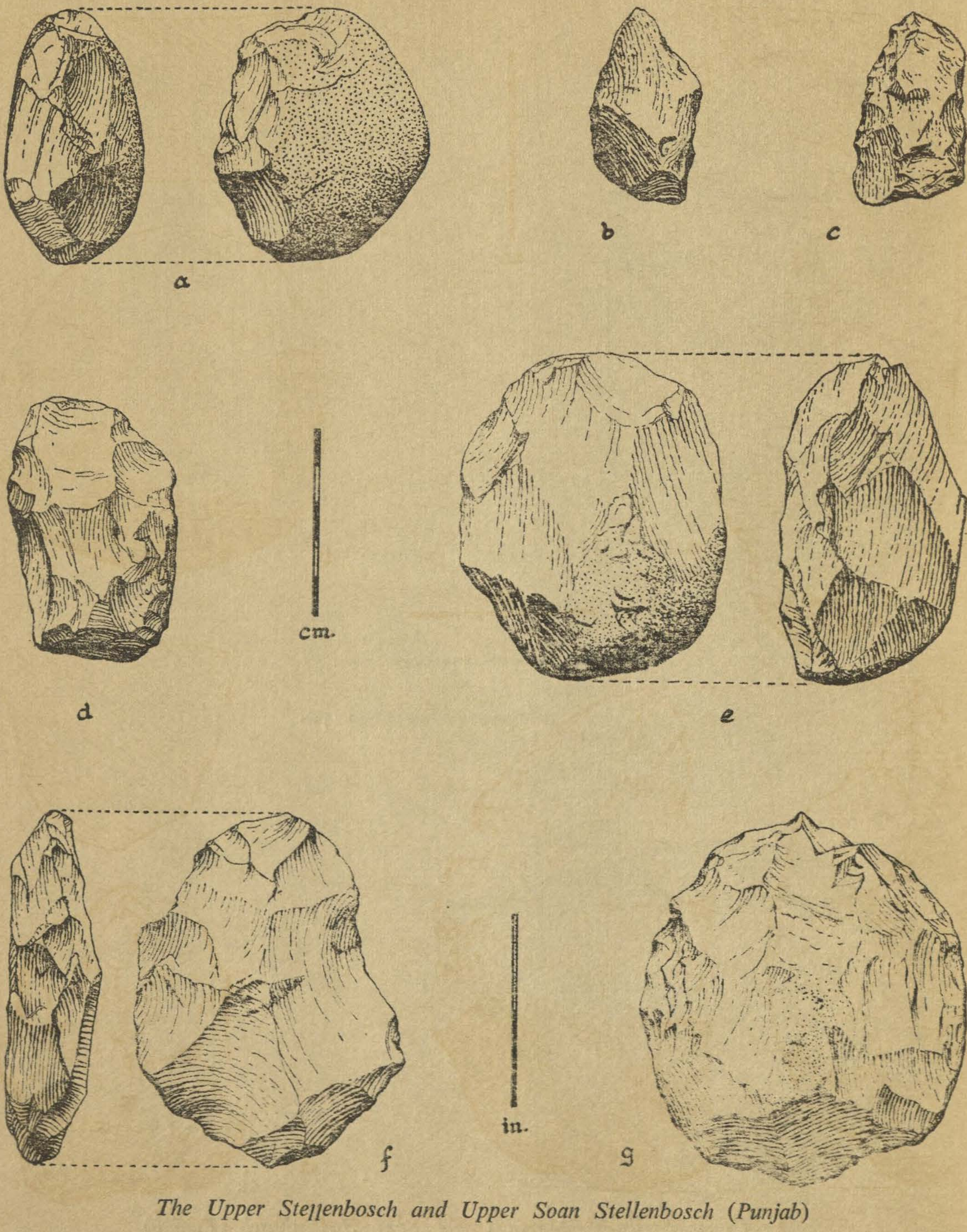


The Upper Stellenbosch and Upper Soan Stellenbosch (Punjab)



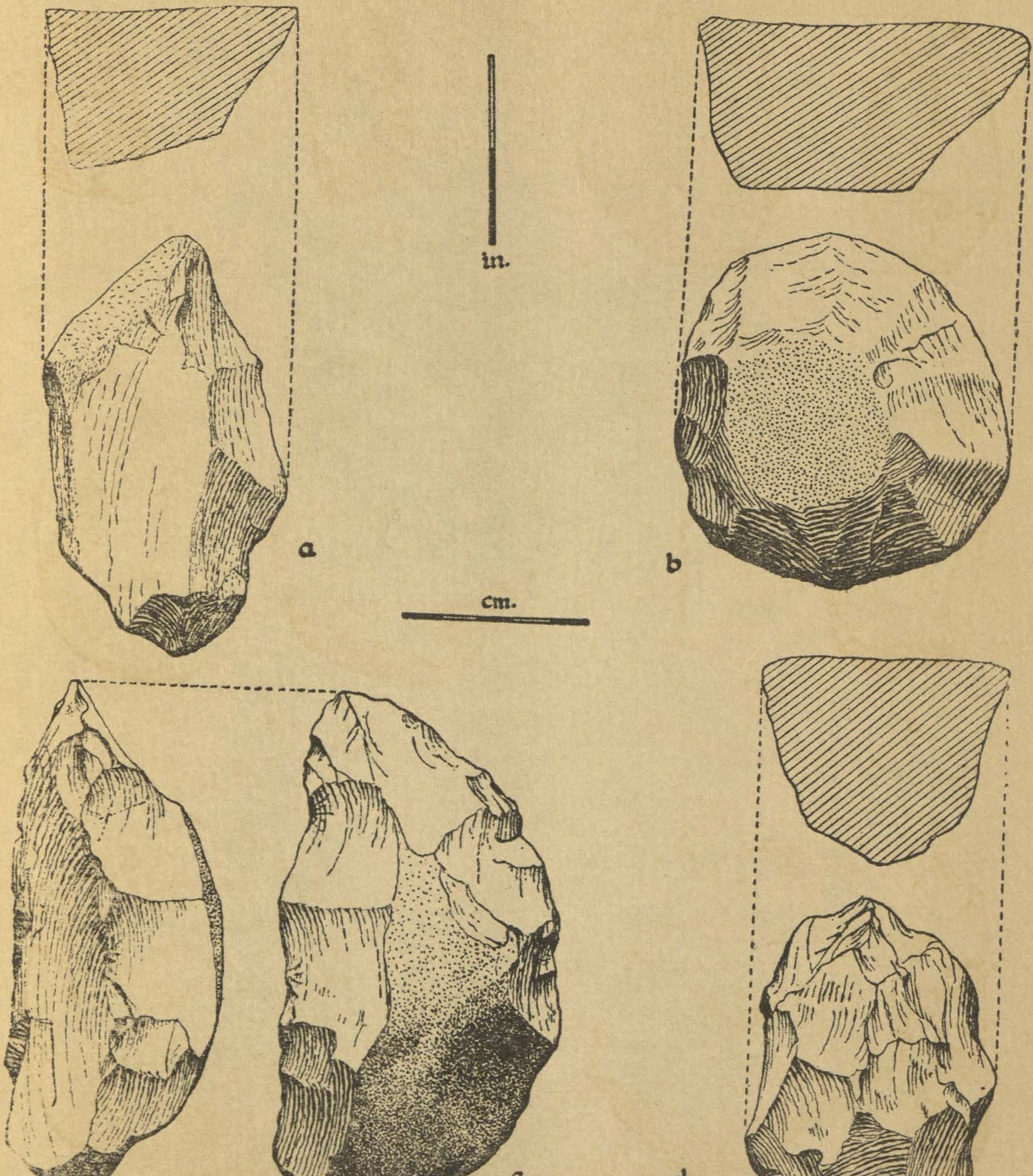
The Upper Stellenbosch and Upper Soan Stellenbosch (Punjab)

Figure 51



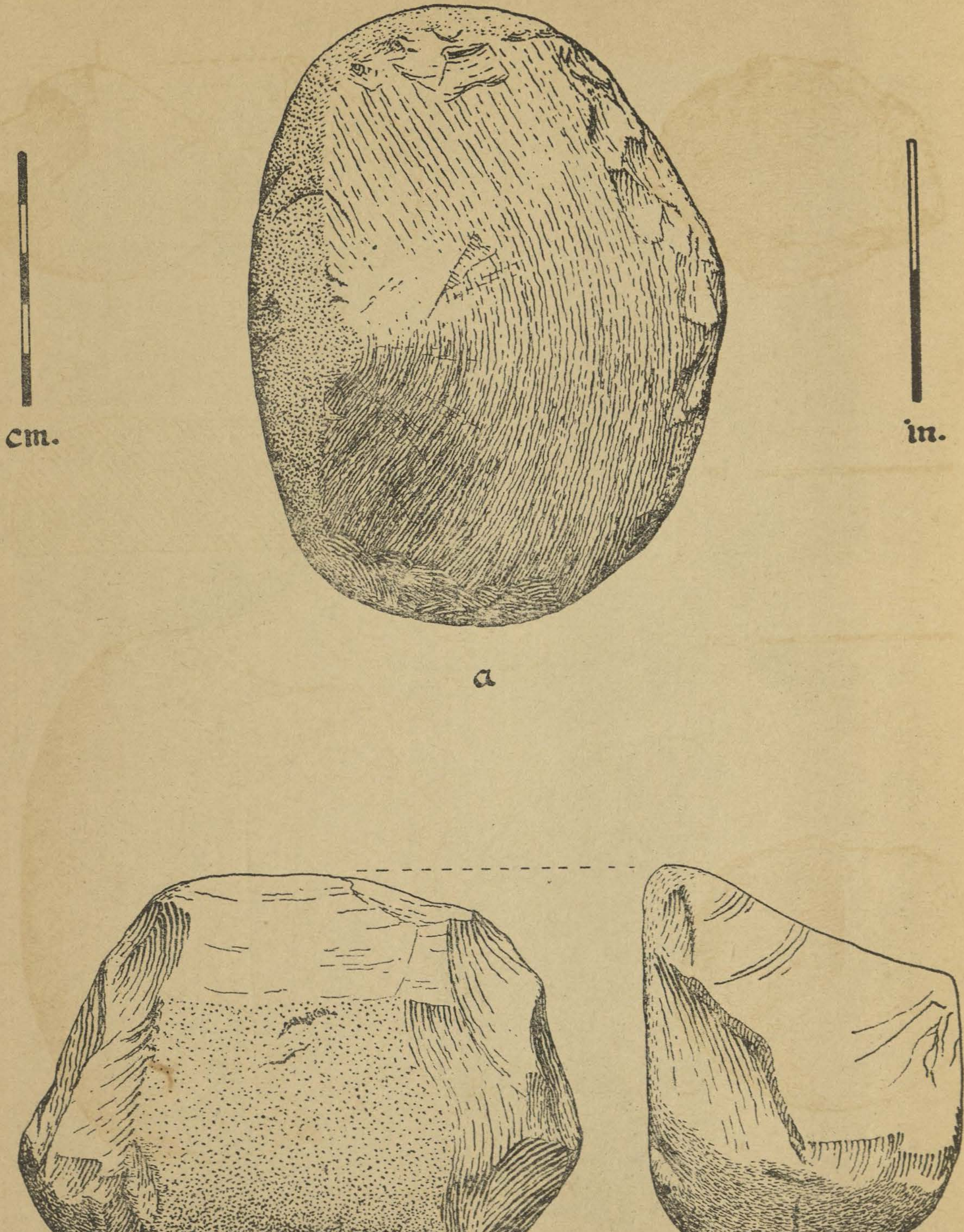
The Upper Stellenbosch and Upper Soan Stellenbosch (Punjab)

Figure 52



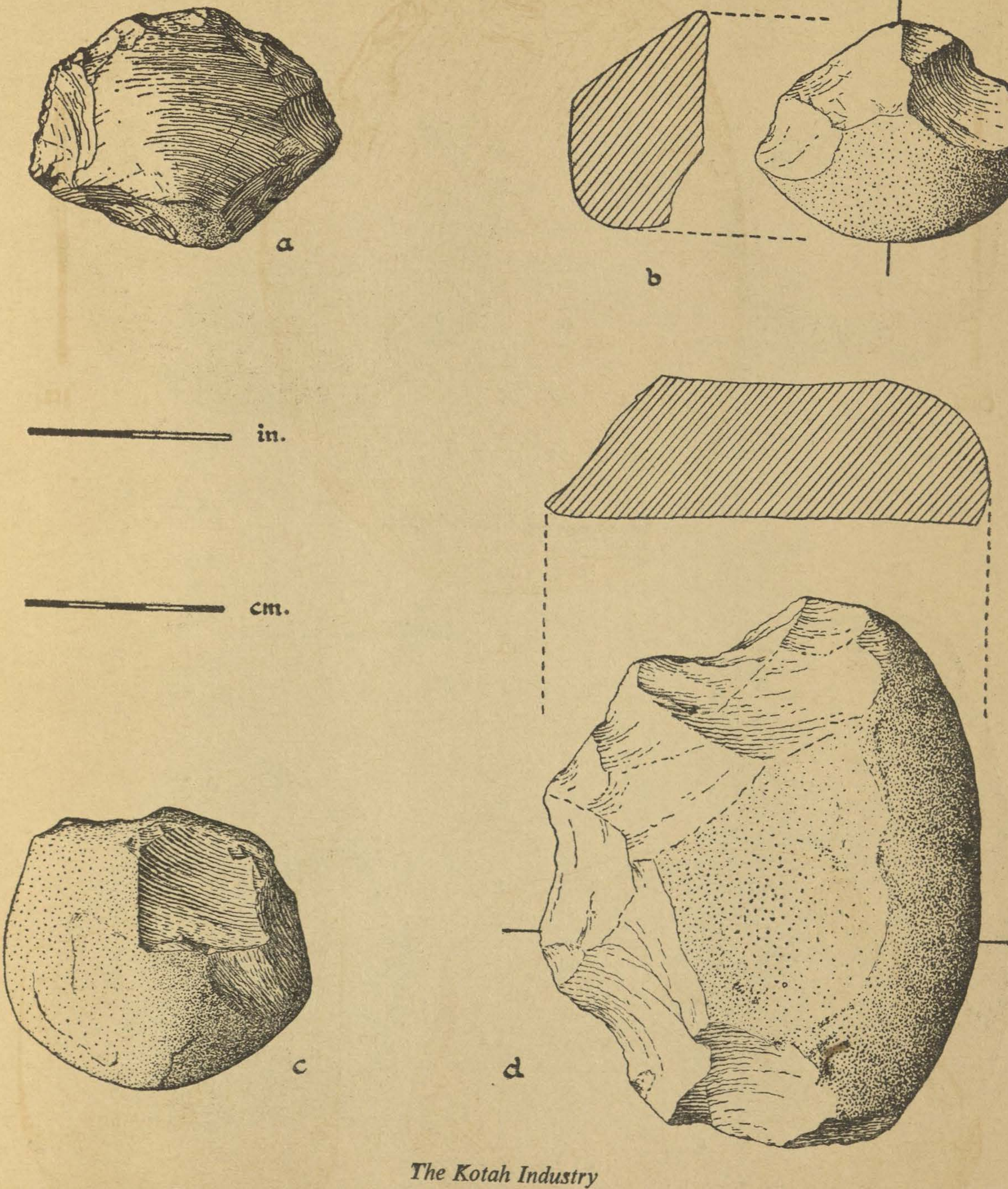
The Upper Stellenbosch and Upper Soan Stellenbosch (Punjab)

Figure 53



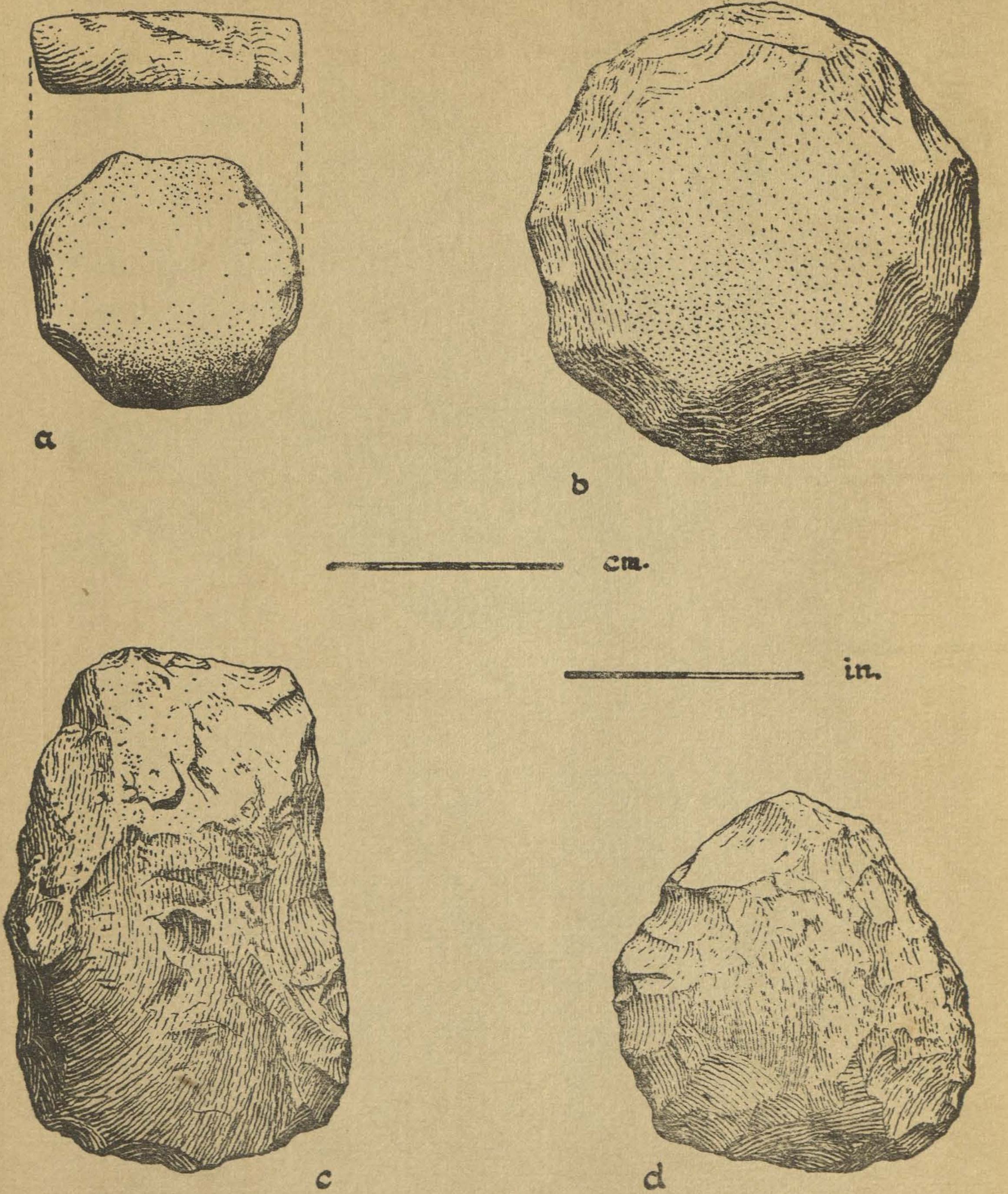
The Upper Stellenbosch and Upper Soan Stellenbosch (Punjab)

Figure 54



The Kotah Industry

Figure 55



The Kotah Industry

Figure 56



Figure 57

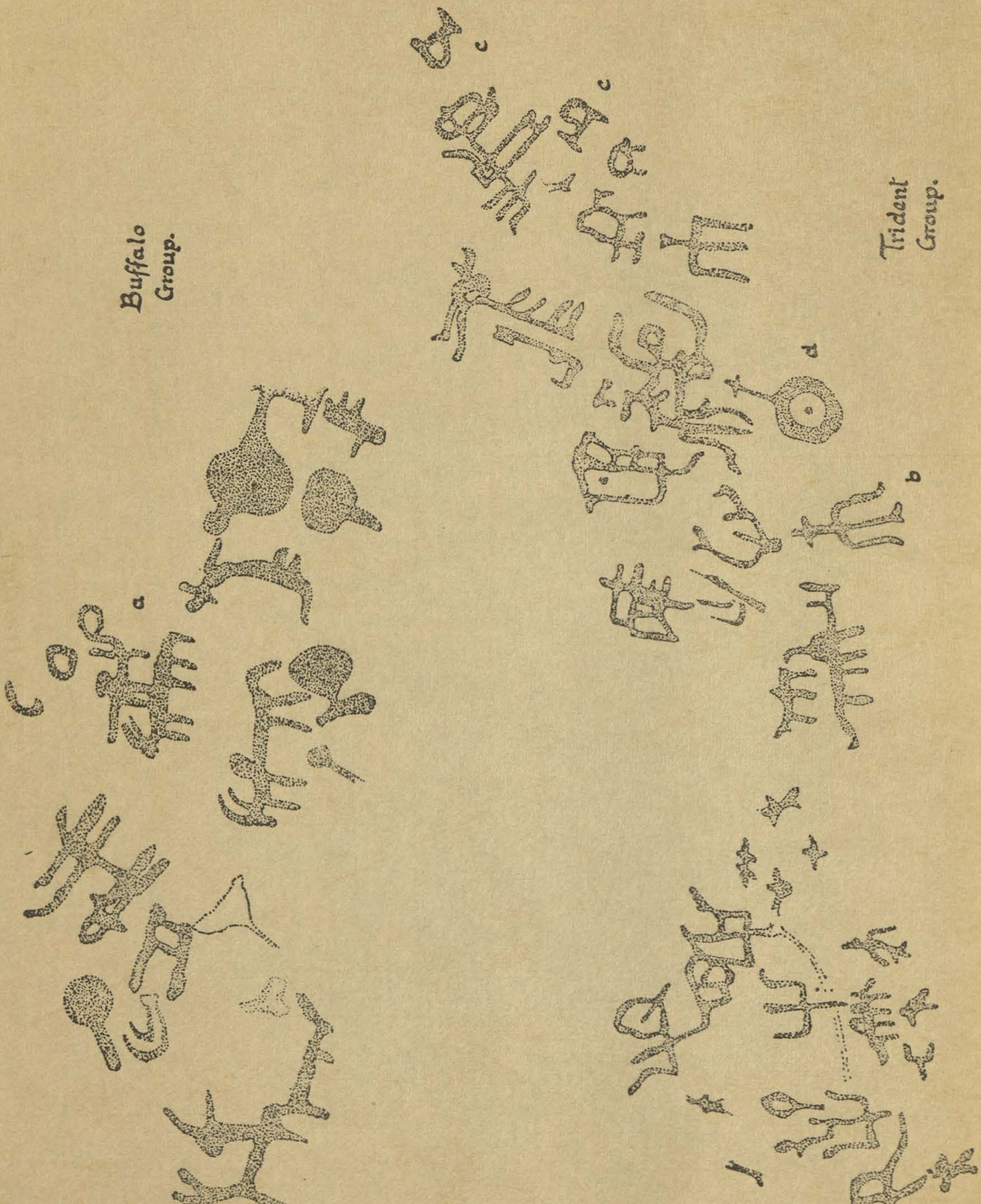


Figure 58

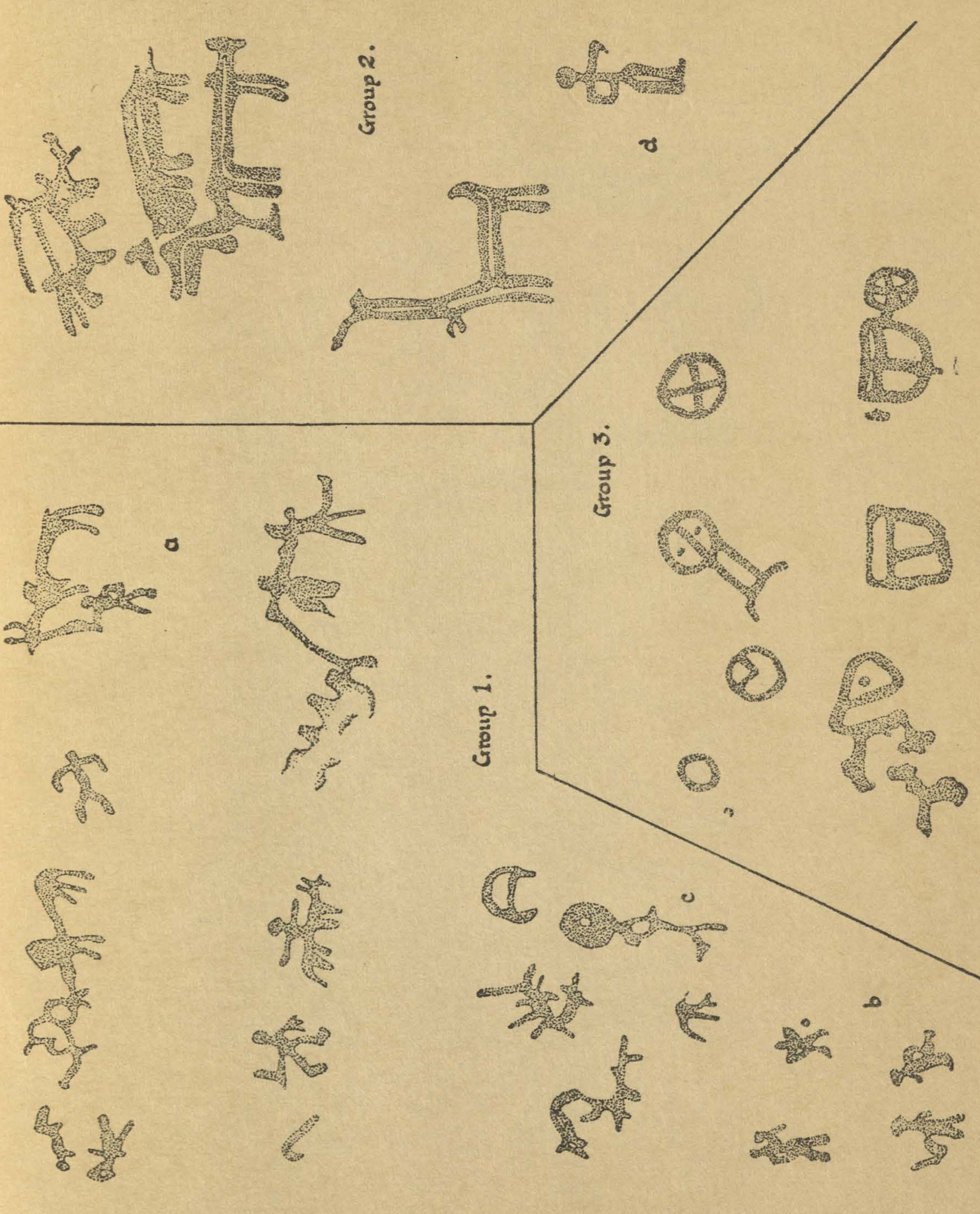


Figure 59